NSF Product Category Rule
for Environmental Product Declarations

NSF 1112-26

Concrete

Version 3

Program Operator: NSF
National Center for Sustainability Standards
Valid through April 30, 2031
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Valid through April 30, 2031

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NSF

Revised by NSF staff with assistance from the

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October 2023 through May 2025

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No participation fees were charged by NSF to interested parties. NSF ensured that reasonable representation among the members of the PCR committee was achieved and potential conflicts of interest were resolved prior to commencing this PCR development. Each member has signed a legal document stating that they have no conflicts of interest.

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Unit abbreviations

The following table is provided as a reference for unit abbreviations for common forms of measurement used within NSF documents.

Time	second	s
	minute	min
	hour	h
	day	d
	week	wk
	month	mo
	year	yr
Length	inch	in.
	foot	ft
	yard	yd
	micrometer	µm
	nanometer	nm
	millimeter	mm
	centimeter	cm
	meter	m
	kilometer	km
	miles	mi
Liquid measure	milliliter	mL
	liter	L
	liters per day	LPD
	liters per minute	LPM
	ounce	oz
	pint	pt
	quart	qt
	gallon	gal
	gallons per minute	GPM
	gallons per day	GPD
Weight	microgram	µg
	picogram	pg
	nanogram	ng
	milligram	mg
	centigram	cg
	gram	g
	kilogram	kg
	pound	lb
	ton	t
	metric ton	mt

Miscellaneous	megapascals	MPa
	nautical miles	nm
	pounds per square inch	psi
	tonne-kilometer	tkm

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Foreword

This subproduct category rule (PCR) addresses UN CPC Group 375 – Concrete and enables the development of environmental product declarations (EPDs) associated with the production of that product from cradle-to-gate. This PCR was developed specifically for use where applicants use the following standards: ASTM C94, CSA A23.1/A23.2, UNSPSC code 30111500. An additional PCR is required for concrete products to outline the additional LCA stages such as formwork, reinforcement and curing.

ISO 21930:2017 provides the core rules for construction products and services and must be read in tandem with this document. Technical issues in this sub-category PCR related to concrete production build from the CLF Concrete PCR and align with the ASTM *PCR for Precast Concrete (UN CPC 37550)* in order to increase standardization of LCA practice in regions that use ASTM standards for concrete.

The development of this PCR was supported by The National Ready Mixed Concrete Association.

This edition of the PCR contains the following revisions:

- **Issue 3**

  This revision updates throughout the document and harmonizes with upstream PCRs where possible.

- **Issue 4**

  This revision improves clarity of portable batch plants vs. mobile volumetric mixers. It adds a definition for each of those terms in Section 3, and modifies language in Section 7.1.7.2.

Suggestions for improvement of this guideline are welcome. Comments should be sent to ncss@nsf.org, or c/o NSF, National Center for Sustainability Standards, PO Box 130140, Ann Arbor, Michigan 48113-0140, US.

About the NSF National Center for Sustainability Standards

Through the NCSS, 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, electronics, and water and wastewater.

The NCSS seeks to continue to add to its growing portfolio while providing education, outreach, and innovation support to private industry, trade associations, government and academia to foster a consensus-based approach toward conformity assessment in the sustainability field. Visit nsfsustainability.org or contact ncss@nsf.org.

About the National Ready Mixed Concrete Association (NRMCA)

NRMCA, a non-profit organization based in Silver Spring, MD, represents the producers of ready mixed concrete and the companies that provide materials, equipment and support to the industry. It conducts education, training, promotion, research, engineering, safety, environmental, technological, lobbying and regulatory programs. For more information on NRMCA's Sustainability Initiatives, visit nrmca.org/sustainability.

NSF Product Category Rule
for Environmental Product Declarations –

Concrete
Version 3

1 Scope

Per ISO 21930:2017 [1] Clause 1, with the following additions:

This sub-category PCR addresses the goal and scope of LCAs for UNCPC Group 375, Master Format 03 30 00, "Cast-in-Place Concrete" in order to produce EPDs according to ISO 14025:2006 [1] and ISO 21930:2017, and optional conformance to ISO/TS 14027:2017. [1] This PCR is applicable to concrete that is manufactured in a batching plant, either permanent or mobile, including volumetric mixing, and then delivered to a construction site in a ready-to-use form. Development of this PCR is informed by *A Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete Manufactured by NRMCA Members – Version 3.2*, July 2022. [2] This PCR enables the development of EPDs associated with the production of concrete materials from cradle-to-gate, for life cycle stage, Modules A1 to A3, plus the optional reporting of Module A4. This PCR is intended to be used to model the environmental impacts of applicable products produced or sold within North America. This PCR was developed specifically for use where applicants use the following standards: ASTM C94, [3] ASTM C476, [3] CSA A23.1/A23.2, [4] UNSPSC code 30111500. Table 1 lists applicable standards and specifications for this PCR.

Applicable products including conventional concretes, lightweight concrete, high performance concretes, ultra-high-performance concretes, flowable fill, slurry, and cementitious grout products produced by ready mix concrete facilities are considered under this PCR. This PCR is not applicable to precast concrete or concrete masonry, which have their own subcategory PCRs.

While this PCR will likely be used primarily in North America, it may be used in other regions where program operators deem it appropriate.

This PCR is valid through April 30, 2031.

The materials commonly used in concrete are listed in Table 1.

[1] International Organization for Standardization. Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland. <iso.org>

[2] Athena Sustainable Materials Institute. 280 Albert Street, Suite 404, Ottawa, Ontario K1P 5G8, Canada. <nrmca.org/wp-content/uploads/2022/02/NRMCA_LCAReportV3-2_20220224.pdf>

[3] ASTM International. 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428. <astm.org>

[4] CSA Group. 178 Rexdale Boulevard, Toronto, ON M9W 1R3, Canada. <csagroup.org>

Table 1
Concrete materials and related standards

Materials	Description/specification
portland cement	ASTM C150/C150M, AASHTO M 85, or CSA A3001
blended hydraulic cements	ASTM C595/C595M, AASHTO M 240, or CSA A3001
portland-limestone cement	ASTM C595/C595M, AASHTO M 240, or CSA A3001
performance-based hydraulic cement	ASTM C1157/C1157M
ultra-high-performance concrete	ASTM C1856/C1856M
fine aggregate – natural sand	ASTM C33/C33M, CSA A23.1
fine aggregate – manufactured	ASTM C33/C33M, CSA A23.1
coarse aggregate – natural gravel	ASTM C33/C33M, CSA A23.1
coarse aggregate – crushed	ASTM C33/C33M, CSA A23.1
lightweight aggregates	ASTM C330/C330M
SCMs – coal ash	ASTM C618, ASTM C1660, ASTM C1697, ASTM C1912/C1921M, AASHTO M 295, AASHTO M 302, CSA A3001
SCMs – silica fume	ASTM C1240, AASHTO M 307, CSA A3001
SCMs – blast furnace slag cement	ASTM C989/C989M, AASHTO M 302, CSA A3001
SCMs – glass pozzolan	ASTM C1866/C1866M, CSA A3001
SCMs – natural pozzolan	ASTM C618, ASTM C1945, CSA A3001
cements that require carbonation curing	ASTM C1905/C1905M, ASTM C1910/C1910M
chemical admixture – accelerators	ASTM C494/C494M Type C/E
chemical admixture – air entraining agent	ASTM C260/C260M
chemical admixture – hardening accelerators	ASTM C494/C494M Type C
chemical admixture – plasticizer and super-plasticizers	ASTM C494/C494M Type F/G, ASTM C1017/C1017M
chemical admixture – retarders	ASTM C494/C494M Type B/D
chemical admixture – water reducing/resisting	ASTM C494/C494M Type A/B/D/E
chemical admixture – coloring and pigments	ASTM C979/C979M
chemical admixture – corrosion inhibitors	ASTM C494/C494M Type C/E, ASTM C1582/C1582M
fiber reinforcement (including steel, synthetic, glass, and natural fibers)	ASTM A820/A820M, ASTM C1666/C1666M, ASTM D7357, ASTM D7508/D7508M
batch water	ASTM C1602

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.

Per ISO 21930:2017 [1] Clause 2, with the following additions.

AASHTO M 85-22, *Standard Specification for Portland Cement* [5]

AASHTO M 240M/M 240-20, *Standard Specification for Blended Hydraulic Cement* [5]

AASHTO M 295-21, *Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete* [5]

AASHTO M 302-19, *Standard Specification for Slag Cement for Use in Concrete and Mortars* [5]

AASHTO M 307-13(2021), *Standard Specification for Silica Fume Used in Cementitious Mixtures* [5]

ACLCA, *Guidance for Determining EPD Types and Calculating and Communicating Data Specificity Through the Supply Chain* [6]

ACLCA, *Guidance for Quantifying Renewable Electricity Instruments in Environmental Product Declarations (EPDs)* [6]

ASTM A820/A820M-22, *Standard Specification for Steel Fibers for Fiber-Reinforced Concrete* [3]

ASTM C33/C33M, *Standard Specification for Concrete Aggregates* [3]

ASTM C94, *Standard Specification for Ready-Mixed Concrete* [3]

ASTM C150/C150M, *Standard Specification for Portland Cement* [3]

ASTM C260/C260M, *Standard Specification for Air-Entraining Admixtures for Concrete* [3]

ASTM C330/C330M, *Standard Specification for Lightweight Aggregates for Structural Concrete* [3]

ASTM C476, *Standard Specification for Grout for Masonry* [3]

ASTM C494/C494M, *Standard Specification for Chemical Admixtures for Concrete* [3]

ASTM C595, *Standard Specification for Blended Hydraulic Cements* [3]

ASTM C618, *Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete* [3]

ASTM C979/C979M, *Standard Specification for Pigments for Integrally Colored Concrete* [3]

ASTM C989/C989M, *Standard Specification for Slag Cement for Use in Concrete and Mortars* [3]

ASTM C1017/C1017M, *Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete* [3]

[5] American Association of State Highway and Transportation Officials. 555 12th Street NW, Suite 1000, Washington, DC 20004. <transporation.org>

[6] American Center for Life Cycle Assessment. 6900 Wisconsin Avenue, Unit 30953, Bethesda, MD 20824. <aclca.org>

ASTM C1157/C1157M, *Standard Performance Specification for Hydraulic Cement* [3]

ASTM C1240, *Standard Specification for Silica Fume Used in Cementitious Mixtures* [3]

ASTM C1582/C1582M-24, *Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete* [3]

ASTM C1600/C1600M-24, *Standard Specification for Rapid Hardening Hydraulic Cement* [3]

ASTM C1602/C1602M, *Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete* [3]

ASTM C1666/C1666-M-24 *Standard specification for alkali resistant (AR) glass fiber for GFRC and fiber-reinforced concrete and cement* [3]

ASTM C1697-21, *Standard Specification for Blended Supplementary Cementitious Materials* [3]

ASTM C1856/C1856M *Standard practice for fabricating and testing specimens of ultra-high performance concrete* [3]

ASTM C1866/C1866M-20, *Standard Specification for Ground-Glass Pozzolan for Use in Concrete* [3]

ASTM C1905/C1905M, *Standard Specification for Cements that Require Carbonation Curing* [3]

ASTM C1921/C1921M-22, *Standard Test Method for Comparative Impact Testing of Gypsum Panel Outside 90° Corner Systems* [3]

ASTM C1945, *Standard specification for raw or calcined natural pozzolan for use in concrete* [3]

ASTM D7357, *Standard specification for cellulose fibers for fiber-reinforced concrete* [3]

ASTM D7508/D7508M, *Standard specification for polyolefin chopped strands for use in concrete* [3]

CSA A23.1/A23.2, *Concrete materials and methods of concrete construction/Test methods and standard practices for concrete* [4]

CAN/CSA A3000-03, *Cementitious Materials Compendium (containing A3001 Cementitious Materials for use in Concrete)* [4]

FTC, *Green Guides* [7]

Greenhouse Gas Protocol, Product Life Cycle Accounting and Reporting Standard [8]

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

ISO 14025:2006, *Environmental Labels and Declarations – Type III Environmental Declarations – Principles and Procedures* [1]

ISO/TS 14027:2017, *Environmental labels and declarations – Development of product category rules* [1]

[7] Federal Trade Commission. 600 Pennsylvania Avenue, NW, Washington, DC 20580. <ftc.gov>

[8] World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD). <ghgprotocol.org>

ISO 14040:2006/AMD 1:2020, *Environmental Management – Life Cycle Assessment – Principles and Framework* [1]

ISO 14044:2006/AMD 1:2007/AMD 2:2020, *Environmental Management – Life Cycle Assessment – Requirements and Guidelines* [1]

ISO 21930:2017, *Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services* [1]

NRMCA, *A Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete Manufactured by NRMCA Members – Version 3.2*, July 2022 [9]

NSF, *Product Category Rules Program General Program Instructions* [10]

US EPA/600/R-16/096, *Guidance on Assessment for Life Cycle Inventory Data, June 2016* [11]

US EPA, *Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI 2.2)* [12]

USLCI Database Project Development Guidelines [13]

3 Terms and definitions

Per ISO 21930:2017 [1] Clause 3, with the following additions.

admixture: Constituent added during the mixing process in small quantities related to the mass of cement to modify the properties of fresh or hardened concrete (per EN 206:2013 + A1:2016 [14]).

aggregate: Granular material of natural, manufactured, or recycled origin used in construction (per EN 12620:2002 + A1:2008 [14]).

binder: Combination of reactive materials (such as cement and SCMs) that hold aggregates together to provide structural stability.

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 [3])
>
> **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 [3])

[9] National Ready Mixed Concrete Association. 66 Canal Center Plaza, Suite 250, Alexandria, VA 22314. <nrmca.org>

[10] Available upon request from ncss@nsf.org.

[11] US Environmental Protection Agency. 1200 Pennsylvania Avenue NW, Washington, DC 20004. <epa.gov>

[12] Tool for Reduction and Assessment of Chemicals and Other Environmental Impacts (TRACI), US Environmental Protection Agency. 1200 Pennsylvania Avenue NW, Washington, DC 20004. <epa.gov>

[13] Life Cycle Indicators Database, US Department of Energy and Renewable Energy. 1000 Independence Avenue SW, Washington, DC 20585. <nrel.gov>

[14] European Standards s.r.o. Krimicka 134, 318 00 Pilsen, Czech Republic. <en-standard.eu>

mortar: A hydraulic cement manufactured for use in masonry mortar designed for specific bond and air content criteria. (ASTM C219 [3])

oil well: Either portland or blended cement mixed with water and additives to form a slurry to be used for oil-well grouting. Well cement shall be specified using classes A, B, C, D, G and H and the grades: ordinary (O), moderate sulfate-resistant (MSR) and high sulfate-resistant (HSR). (API Specification 10A [15])

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 [3])

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 [3])

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 [3])

concrete: Concrete is a composite material that consists of air and a binding medium (cementitious materials and water, and possibly one or more admixtures) embedded with fine aggregate (typically sand) intermediate aggregates (typically finer gravel), and coarse aggregate (typically gravel) to form a hard solid mass. While the most widely used hydraulic cements are portland cement and portland-limestone, other hydraulic cements include blended cements, geopolymer cements, and cementitious material such as slag cement. Pozzolans, both natural and artificial (e.g. glass, coal ash, and silica fume) are often used as a cementitious ingredient of concrete (adapted from the definition by Mather and Ozyildriim [16]). Other novel or innovative materials are also occasionally used.

co-product: any two or more products coming from the same unit process or product system. (ISO 14044, Clause 3.10 [1])

cubic meter (metre) of concrete: Quantity of fresh concrete, which occupies a volume of one cubic meter (adapted from EN 16757:2017 [14]).

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 [1])

data:

primary: Data determined by direct measurement, estimation or calculation based on specific original source measurements for the specific system under investigation.

secondary: Data indirectly determined through measurement, estimation or calculation and not based on specific original source measurements. This can include data that is originally developed using primary data sources but is further aggregated to represent average processes or products.

[15] American Petroleum Institute. 200 Massachusetts Avenue NW, Suite 1100, Washington, DC 20001. <api.org>

[16] Mather, B. & Ozyildirim, C. (2002). SP-1(02): Concrete Primer. American Concrete Institute: SP0102.

background: Data contained within the process(es) supporting the foreground system. Background data constitute the "background system" in a product system.

foreground: Data contained within the process(es) a manufacturer is modeling for its product system. This term should be used, for example, when describing processes associated with the production of the material the manufacturer is producing. This term is defined in the US EPA *Life Cycle Assessment Principles and Practices Glossary*[11] as "data from the foreground system that is the system of primary concern to the analyst." Foreground data constitute the "foreground system" in a product system.

environmental product declaration (EPD): A third-party verified environmental declaration (ISO 14025:2006, Clause 3.1[1]) providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information (source: ISO 21930[1]). EPDs may be of the following types:

facility-specific EPD: An EPD that covers a single manufacturer and a single facility for the last facility in the production chain.

industry-average EPD: An EPD that reports the impacts for a product which is an average of data provided by multiple manufacturers in a clearly defined sector and/or geographical area.

manufacturer-average EPD: EPD results represent the environmental impacts of a specific product or group of products as produced by a specific manufacturer. This type of EPD aggregates data across all of the manufacturer's facilities or operational sites, creating an average environmental impact profile that represents the company's overall production practices for that product or product group.

product-average EPD: An EPD that covers a group of similar products from one or more sites of one company or multiple companies, or an EPD that groups similar products using averaged environmental performance data across Modules A1 to A3.

product-specific EPD: EPD results for a specific product or group of products that share equivalent material and performance characteristics, categorized by performance.

product- and facility-specific EPD: EPD results for a specific product or group of products that share equivalent material and performance characteristics, categorized by performance, and covers a single manufacturer and a single facility for the last facility in the production chain.

EPD scope: Refers to the covered life cycle information modules (e.g. A1 to A3, or A1 to A4).

EPD type: Refers to the EPD being disclosed, as defined above (e.g. product-specific, industry-average, etc.).

material:

secondary material: Material recovered from previous use or recovered from waste derived from another product system and used as an input in another product system. (ISO 21930:2017[1])

> *Note*. Burdens from the system generating secondary or recovered materials are not accounted for in this PCR and only impacts associated with preparation and transportation of the material should be accounted for.

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, instead of a new primary material, for recycling or a manufacturing process. (ISO 14021:2016[1])

modularity: Modularity refers to breaking down the product's life cycle into distinct stages, (e.g. production stage includes Modules A1 to A3, construction stage includes A4, etc.) that each represent a specific stage of the product's life.

polluter pays: A policy approach where each actor responsible for pollution within a product's life cycle bears the cost of managing and reducing their environmental impacts.

mobile volumetric mixing equipment: Mobile concrete mixers that store raw ingredients (sand, stone, cement, water and chemical admixture) in separate, on-board compartments, mixing them only as needed on-site. Unused materials do not harden and remain in the truck, where they are brought back to the depot for future jobs.

net consumables: Items used during manufacturing, such as lubricants, grease, and oils.

portable equipment: A mobile, compact, and often self-erecting unit designed to produce wet or dry batch concrete directly at construction sites or remote locations.

waste:

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 RCRA. [17] See also 40 CFR 261.33. [18] For the Canadian market wastes are hazardous if they are regulated under CEPA, 1999 Regulations. [19]

Note. Hazardous waste does not include radioactive waste; see ISO 21930:2017 [1] Clause 7.2.14.

non-hazardous waste: Commercial/industrial waste that is not hazardous: dust, spoil and other waste from raw materials extraction; waste treated in municipal disposal scheme; and leftover or waste concrete and neutral pH yard scrapings.

4 Abbreviated terms

Per ISO 21930:2017 [1] Clause 4, with the following additions:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADP	abiotic depletion potential
AP	acidification potential
ASTM	ASTM International
B2B	business-to-business
B2C	business-to-consumer
CEPA	Canadian Environmental Protection Act
CFR	Code of Federal Regulations
CLF	Carbon Leadership Forum
CPC	Central Product Classification
CSA	CSA Group
CSI	Construction Specifications Institute
EAC	environmental attribute certificates
EFCA	European Federation of Concrete Admixtures Associations
EN	European Standards designation
EOL	end-of-life
EP	eutrophication potential
EPA	Environmental Protection Agency

[17] Resource Conservation and Recovery Act, US Environmental Protection Agency. <epa.gov/rcra>

[18] Code of Federal Regulations, Office of the Federal Register, National Archives and Records Administration. 7 G Street NW, Suite A-734, Washington, DC 20401. <ecfr.gov>

[19] Department of Justice, Government of Canada. 284 Wellington Street, Ottawa, ON K1A 0H8, Canada. <laws.justice.gc.ca>

EPD	Environmental Product Declaration
ESCSI	Expanded Shale, Clay and Slate Institute
FTC	Federal Trade Commission
GBFS	granulated blast furnace slag
GGBFS	ground granulated blast furnace slag cement
GWP	global warming potential
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LCA	life cycle assessment
LCI	life cycle inventory
LEED	Leadership in Energy and Environmental Design
MR	materials and resources
NERC	North American Electric Reliability Corporation
NREL	National Renewable Energy Laboratory
NRMCA	National Ready Mixed Concrete Association
ODP	ozone depletion potential
OEM	operations equipment maintenance
PCR	Product Category Rule
POCP	photochemical ozone creation potential
PPA	power purchase agreement
REC	renewable energy certificate
RCRA	Resource Conservation and Recovery Act (US)
RNA	Rotor-Nacelle Assembly
RSL	reference service life
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SCA	Slag Cement Association
SCM	supplementary cementitious material
SI	International System of Units (Système international d'unités)
UAE	United Arab Emirates
UK	United Kingdom
ULE	UL Environment
UN	United Nations
US	United States
USGBC	US Green Building Council
USLCI	United States Life Cycle Inventory
UNSPSC	United Nations Standard Products and Services Code

5 General aspects

5.1 Objectives of this PCR

Per ISO 21930:2017 [1] Clause 5.1, with the following additions:

The primary objective of this sub-category PCR is to provide rules for the application of ISO 21930:2017 to create Type III EPDs for concrete products used in building and civil engineering works, as identified in Table 1.

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 concrete producers and suppliers of innovative materials to quantify, report, better understand and reduce the environmental impacts of concrete
- promote transparency and incentivize manufacturer-specific upstream data
- represent concrete appropriately following international standards for building materials and products;
- specify the data quality and default data to be used in concrete EPDs
- support the use and guidance of EPDs in sustainable design construction programs and ratings

- address requirements for creating an industry average EPD to enable a pathway towards comparative assessment against manufacturer-, facility-, and product-specific EPDs supporting green construction to the degree possible
- enable consistent and comparable reporting of LCA results related to concrete production.

5.2 Life cycle stages

Per ISO 21930:2017 [1] Clause 5.2, with the following clarifications.

This PCR enables reporting of a cradle-to-gate (A1 to A3) with options EPD with the following restrictions.

Optional information modules beyond the gate shall only be allowed for:

- cradle-to-construction site, which covers the mandatory production stage (A1 to A3) and transportation to construction site (A4). The LCA result shall be reported based on a declared unit.

Information modules covering installation (Module A5), the use (Module B) and end-of-life (Module C) are not permitted to be included in EPDs developed under this PCR.

As stipulated by ISO 21930:2017, the system boundary shall follow both the modularity and polluter pays principle. These terms are discussed in greater detail in ISO 21930:2017 Clause 7.1.1 and Table 1.

5.3 Average EPDs for groups of similar products

Per ISO 21930:2017 [1] Clause 5.3, with the following clarifications and additions:

- examples of average EPD grouping for concrete products include:
  - industry-average, manufacturer-average, or facility-average
  - performance categories of compressive strength and concrete cure time
  - material characteristics of lightweight concrete
  - production category of ready-mix.
- if any environmental indicators for products included in the average differ by more than ± 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
- for full transparency, product-specific and manufacturer-specific EPDs are encouraged.

5.4 Use of EPDs for construction products

Per ISO 21930:2017 [1] Clause 5.4, with the following clarifications.

This PCR is to create EPDs for use in B2B communication.

The manufacturer, or group of manufacturers, of the construction product is the sole owner of the EPD and is responsible for developing the EPD of the construction product according to this PCR. Only the manufacturer or group of manufacturers is authorized to declare the environmental performance of the construction product using an EPD.

5.5 Comparability of EPDs for construction products

Per ISO 21930:2017 [1] Clause 5.5, with the following clarifications and additions.

Comparison of construction products using an EPD shall be performed in the context of the construction works. Consequently, a comparison of the environmental performance of the construction products using the EPD shall consider all the relevant information modules over the full life cycle, not just the A1 to A3 modules, of the product within the construction works.

Requirements for comparability of EPDs given in ISO 21930:2017 Clause 5.5, shall apply with the following clarifications:

- comparison based on LCA A1 to A3 data, shall be made only if the same secondary data sets, and all expected subsequent life cycles are equivalent for both EPDs
- where A1 to A3 or A1 to A4 concrete EPDs are used to compare two different concrete mixes, the following are required:
    - declared units shall be the same
    - the concrete mixes shall be functionally equivalent
    - all relevant aspects of Table 2 shall be considered to determine equivalency.

5.6 Documentation

All documentation requirements outlined in ISO 21930:2017 [1] Clause 5.6 shall be met, including those of the project report (also discussed in Section 10 of this sub-category PCR).

6 PCR development and use

Per ISO 21930:2017 [1] Clause 6, with the following addition.

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 shall 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 [1] Clause 7.1.1.

7.1.2 Functional unit

Per ISO 21930:2017 [1] Clause 7.1.2, with the following clarifications and additions.

No functional unit is defined in this PCR. However, performance characteristics of concrete shall be reported per Table 2.

Table 2
Mandatory and optional performance characteristics

Performance characteristic	Definition	Value type	Unit
Mandatory			
specified compressive strength	Per ASTM C39/C39M, AASHTO T 22, or CSA A23.2-9C (28-d strength unless otherwise specified)	numeric	PSI or MPa @ days
lightweight concrete	Is the mix classified as lightweight concrete? (Density between 70 and 120 lb/ft^3 or 1120 and 1920 kg/m^3)	yes/no	N/A
Optional			
later age compressive strength and time period	Per ASTM C39/C39M, AASHTO T 22, or CSA A23.2-9C	numeric	PSI or MPa @ days
high-early-strength and time period	If the concrete reaches high strength early, report the specified compressive strength and the time to reach that strength	numeric	PSI or MPa, hours or days
exposure class	Per ACI 318 Section 19 3.2.1 or CSA A23.1	from list (may select multiple)	N/A
flexural strength	Per ASTM C78/C78M, T97/T97M	numeric	PSI or MPa @ days
unit weight	Per ASTM C138/C138M, AASHTO T 121, or CSA A23.2-6C	numeric	lbs/ft^3 or kg/m^3
portable equipment	Does the product come from portable equipment?	yes/no	N/A
slump or slump flow	Per ASTM C143/C143M, ASTM C1611/C1611M, CSA A23.2-5C, or CSA 23.2-19C	numeric	inches or mm
water-to-cementitious ratio (w/cm)	Water to cementitious materials ratio (by mass)	numeric	dimensionless
cement type	Per ASTM C150/C150M, ASTM C595/C595M, ASTM C1157/C1157M, or CSA A3001	from list (may select multiple)	N/A
air content	Per ASTM C231/C231M, ASTM C173/C173M, AASHTO T 152, AASHTO T 121, CSA A23.2-4C, or CSA A23.2-7C	percentage	%
SCM content	SCM content as a percentage of total cementitious material (by mass)	percentage by mass	%
SCM type	Per ASTM C618, ASTM C989/C989M, ASTM C1240, ASTM C1600, ASTM C1697, ASTM C1866/C1866M, ASTM C1905, ASTM C1910, ASTM C1912/C1921M, ASTM C1945, or CSA A3001	from list (may select multiple)	N/A
fiber-reinforced	Does the mix utilize any type of fiber reinforcement?	yes/no	N/A
lightweight aggregate	Does the mix contain lightweight aggregate per ASTM C330	yes/no	N/A
typical application	Typical application of the mix.	open text	N/A

7.1.3 Declared unit

Per ISO 21930:2017 [1] Clause 7.1.3, with the following clarifications.

A declared unit provides a reference by which a product is normalized to produce data expressed on a common basis and is appropriate when the precise function of the product at the construction works is not stated or within scope. The requirements for establishing a declared unit given in ISO 21930:2017 Clause 7.1.3 shall apply, with the following clarifications.

An EPD prepared according to this sub-category PCR shall cover the production stage (A1 to A3) and may include Module A4 from the construction stage. Since the use stage is explicitly excluded from this scope, a declared unit shall be used. The declared unit shall be one cubic meter of fresh concrete. Data may additionally be presented per US cubic yards. To convert the results that have been calculated based on the default declared unit (cubic meter) to cubic yards, multiply the results by the conversion factor of 0.7645549 (see Section 7.1.10, 7.645 549 E-01 per NIST [20]).

7.1.4 Reference service life

As this PCR does not address B1 to B7 (Use stage), the RSL of concrete is not applicable.

7.1.5 System boundary with nature

Per ISO 21930:2017 [1] Clause 7.1.5.

7.1.6 System boundary between product systems

Per ISO 21930:2017 [1] Clause 7.1.6.

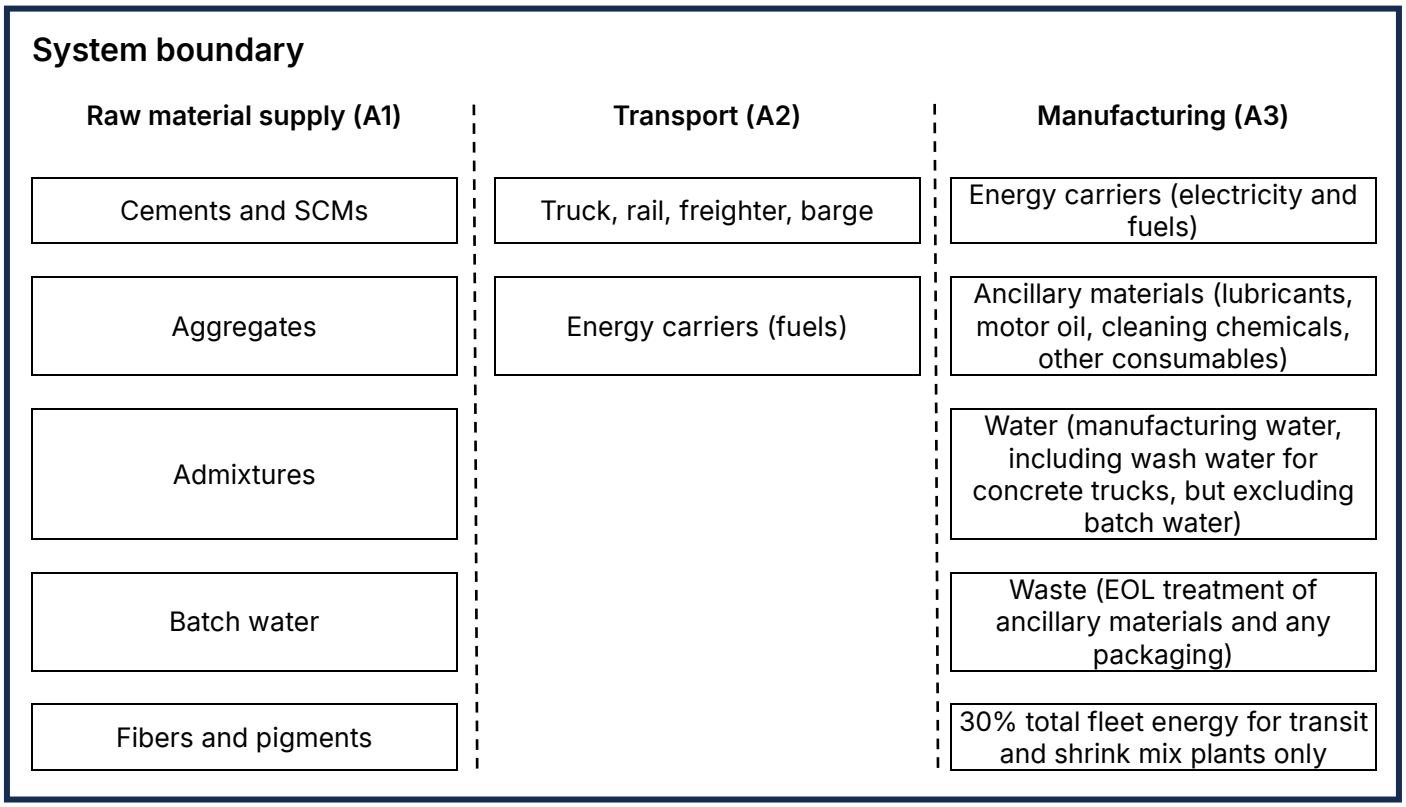
7.1.7 System boundaries and technical information for scenarios

Per ISO 21930:2017 [1] Clause 7.1.7, with the following addition.

A general system boundary diagram is found in Figure 1.

[20] National Institute of Standards and Technology, US Department of Commerce. 100 Bureau Drive, Gaithersburg, MD 20899-8930. <nist.gov>

Figure 1
Example system boundary diagram



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)
- 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 [1] Clause 7.1.7.1, with the following clarification.

Since the scope of an EPD developed to this PCR is limited to cradle-to-gate (A1 to A3) plus options (A4), scenario data for modules other than A1 to A4 are not applicable and thus shall not be reported.

7.1.7.2 A1 to A3, production stage

Per ISO 21930:2017 [1] Clause 7.1.7.2, with the following additions.

Module A1, Raw material production:

- A1 shall include the constituents of concrete listed in Table 1
- A1 shall rely on background data/upstream data that are specified in Annex A. The background data shall include impacts associated with the following processes:
    - production and transmission of electricity
    - production of fuels
    - production and transmission of natural gas
    - production and transmission of water
    - chemical reaction (e.g. calcination reaction emissions) of material production if not already covered by constituent impacts.

Module A2, Transportation to the processing plant:

- A2 shall assume all short- and long-haul truck transport returns empty. The USLCI [13] data for trucking assumes 35% empty backhaul. 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 USLCI.
- A2 shall include all transportation between the raw material production facility and the concrete facility. For all imported materials, see Annex C to assist with calculating impacts of transportation from the cement plant to the concrete plant. Distribution terminals like cement shall use the information provided by the manufacturer who provides the product-specific EPD. It shall be listed on the EPD, or manufacturer shall provide guidance on how to obtain information. This data may be partially completed with primary ocean shipping distance data between the material producer and import terminal. In all cases, the land-based transportation shall be based on primary trucking and train distance data to the concrete production facility. The order of priority for A2 ocean shipping data is as follows:
    - If an EPD is available for the raw material, and the EPD includes transportation to a distribution terminal (whether reported as A2 or A4 in the cement EPD), then this primary data shall be used to represent this portion of the A2 material transportation and added to the other modes of transportation used to move that material to the concrete facility.
    - If an EPD including shipping data is not available and primary shipping distance specific to the route from the originating production facility to the import terminal is available, then this specific distance data shall be used.
    - If no specific data is available for the oceanic shipping distance, then Annex B shall be used to estimate the shipping distance of the raw material. For ports/countries that are not shown in Annex B, determine shipping distances with specific ports using <sea-distances.org> or equivalent tool.

Module A3 requirements shall include the following:

- A3 shall include transportation activities at the concrete manufacturing site.
- A3 shall include an assumption of 2% material loss unless primary data is available and transparently reported in the project LCA report underlying the EPD. Note that material loss is equal to the volume returned or disposed of divided by the total volume produced at the plant over the 12-mo EPD evaluation period.

- A3 shall include ancillary materials which include, but are not limited to, lubricating oils, engine oils, and other consumable OEM products, as well as wash water.
- A3 shall include final EOL treatment for any manufacturing waste. For example, admixture and ancillary material packaging.
- For all truck (transit), mobile volumetric mixing equipment (transit), mixing plant operations covered in the EPD, a default factor of 30% of all mixing truck (fleet) or mobile volumetric mixing equipment (fleet) energy use is to be allocated to Module A3, regardless of whether A4 is reported. This default is to be applied and quoted in the EPD unless a specific power takeoff analysis has been completed and is transparently documented in the project LCA report underlying the EPD per SAFETEA-LU, Section 11144 – PTO Report, SB/SE Research – Philadelphia, Project ID – PHL0019, July 2007, Appendix E. [21]

Modules A1, A2, and A3 shall be reported separately as well as in total A1 to A3. If Module A4 (optional) is included, it shall be reported separately, if applicable. For example:

- **A1**: GWP/m^3 (GWP/yd^3)
- **A2**: GWP/ m^3 (GWP/ yd^3)
- **A3**: GWP/ m^3 (GWP/ yd^3)
- **Total**: GWP/ m^3 (GWP/ yd^3), and optionally
- **A4**: GWP/ m^3 (GWP/ yd^3)

7.1.7.3 A4 to A5, construction stage

7.1.7.3.1 General

Per ISO 21930:2017 [1] Clause 7.1.7.3.

7.1.7.3.2 A4, Transportation to site (optional)

Per ISO 21930:2017 [1] Clause 7.1.7.3, with the following additions.

- A4 is optional. If provided, a description of the reference scenarios shall be part of the EPD. If A4 is included, the reference scenario should include the location of the construction site for which the transportation was calculated as well as the transportation distance and mode. For large projects, where the multiple locations are greater than 50 mi apart, an average shall be used. A4, if included, shall consider the following guidance:
    - This calculation of A4 shall consider the weight of one cubic meter of concrete then apply the same modeling rules as applies for A2 trucking (i.e. application of the 2/1.35 correction factor to account for empty backhauls) as well as the transport short haul LCI from Annex A. Alternatively, plants may also incorporate custom fuel consumption calculations if the fuel consumption and capacity utilization are known for the delivery trucks and then apply diesel combustion data per Annex A (Diesel; combusted in industrial equipment/US).
    - Primary data should be used in the calculation of A4, transportation to site. A4 flows may be determined by the 70% balance of fuel consumption for transit and shrink mixed plants where the remaining 30% is applied to Module A3. If this methodology is used it shall be documented in the EPD and reference scenarios, transportation distances, and concrete density need not be reported. For portable plants, 100% of mixing truck energy shall be allocated to the product.

[21] Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, US Department of Transportation. 1200 New Jersey Avenue SE, Washington, DC 20590. <transportation.gov>

7.1.7.3.3 A5, Installation

A5 is not included in this PCR, and Module A5 shall not be reported.

7.1.7.4 Use stage

7.1.7.4.1 General

7.1.7.4.1.1 B1 to B5, use stage (related to the use of the construction works)

B1 to B5 are not included in this PCR and Modules B1 to B5 do not apply.

7.1.7.4.1.2 B6 to B7, use stage, information modules related to the operation of the construction works

B6 to B7 are not included in this PCR and Modules B6 to B7 do not apply.

7.1.7.5 C1 to C4, EOL-stage

C1 to C4 are not included in this PCR and Modules C1 to C4 do not apply.

7.1.7.6 Benefits and loads beyond the system boundary in optional supplementary Module D

This clause of ISO 21930:2017 [1] does not apply.

7.1.8 Criteria for the inclusion and exclusion of inputs and outputs

Per ISO 21930:2017 [1] Clause 7.1.8.

7.1.9 Selection of data and data quality requirements

Per ISO 21930:2017 [1] Clause 7.1.9, with the following additions.

ISO 21930:2017 (Table 3) shall be supplemented by Table 3 with additional detail on the upstream data to use in developing the EPD. The table outlining primary sources of data shall only list the input and output flows utilized in the EPD.

Table 3
Application of data within Module A1

	Production of commodities, raw materials
process type	upstream processes
preferred data	use product and facility-specific EPD
if preferred data doesn't exist	per Annex A

7.1.9.1 Foreground data

7.1.9.1.1 Time period

Facility-specific datasets (A3) shall include 12 consecutive months of data beginning within 5 yr of the publication date of the EPD. Deviations shall be justified and may include the use of proxy data taken from similar facilities/equipment installed in similar conditions and shall be disclosed in the EPD. Proxy data shall be reported in the data sources section and updated with primary data within 12 mo of the publication date, or when 12 mo of consecutive data becomes available.

The ACLCA *Guidance for Quantifying Renewable Electricity Instruments in Environmental Product Declarations (EPDs)* [6] may be applied within this PCR to support consistent and credible integration of renewable electricity claims. This guidance provides a consensus-based methodology aligned with ISO standards, enabling manufacturers to quantify and report renewable electricity contributions accurately at the product level. Users of this PCR shall refer to the ACLCA *Guidance* to ensure that RECs and PPAs are allocated and documented according to established best practices. RECs reported shall be that of the concrete manufacturer (not that of upstream products) and is limited to A3, results shall be reported with and without RECs.

Under the ACLCA *Guidance*, the following shall apply:

- **allocation records**: Document the allocation of RECs or PPAs at the corporate, facility, or product level. This includes specifying the quantity of renewable electricity attributed to each product and ensuring it aligns with production volumes.
- **balance sheets**: An electricity balance sheet should reflect total electricity consumption, the share covered by renewable sources, and any residual grid mix. This balance sheet confirms that renewable energy contributions are accurately allocated to specific life cycle stages in the EPD.
- **certificate details**: Include unique serial numbers, generation dates, project names, and location of renewable energy sources. This level of detail aids in verifying the specific renewable electricity generation attributes tied to each REC.
- **retirement documentation**: Records that RECs have been retired after use to prevent double counting. This often requires confirmation from a third-party registry or verification body.
- **temporal alignment**: Ensure RECs or PPAs used are contemporaneous with the reporting period (typically within the same year as energy consumption) to meet alignment requirements with standards like ISO 14067 [1] and the *GHG Protocol*. [8]
- **verification and audits**: A third-party verification or audit report, if required, supports transparency. This ensures that renewable electricity claims comply with the ACLCA *Guidance* listed above and ISO standards, reflecting reliable renewable energy claims within the EPD.
- **commitment documentation**: A commitment statement for the EPD validity period, ensuring that the renewable electricity claimed in the EPD remains consistent, often including a contract or letter that attests to long-term renewable energy usage.

7.1.9.1.2 Documents on file

Foreground data shall be based on utility and energy bills, sales records, product designs, and similar records, all of which should be kept on file and easily accessible. Deviations shall be justified.

7.1.9.1.3 Geography

Foreground data for a facility-specific EPD shall be specific to the facility. Company averages are not allowed. Foreground data for industry average EPDs shall be specific to the participating facilities and products that meet the applicable specification(s).

7.1.9.1.4 Data gaps

Data gaps for foreground data shall be filled based on the best available proxy data and the representativeness of this proxy data justified.

7.1.9.2 Background data

7.1.9.2.1 Prioritization of data for upstream processes

Per Annex A, use of upstream data associated with production of commodities and raw materials shall follow this hierarchy:

1. Valid product-specific and facility-specific EPDs with impact categories modeled according to IPCC AR5 [22] for GWP from GHG, or most recent, and TRACI 2.2 [12] for all other impact categories (excluding GHG) the specific inputs associated with the EPD.
2. Either of the following:
    - valid industry-average EPDs with impact categories modeled according to IPCC AR5, or most recent, and TRACI 2.2 as prescribed in Annex A
    - specified datasets as prescribed in Annex A, including critically reviewed LCA studies that are conformant with ISO 14040/14044 [1] that have been published to the USLCI. [13]
3. Publicly available, critically reviewed LCA studies that are conformant with ISO 14040/14044 that have not been published to the USLCI.

7.1.9.2.2 Uniformity in use of life cycle inventories

Manufacturers who develop product-specific EPDs, industry- average EPDs, or public datasets that could be used as upstream data for concrete are strongly encouraged to use the public datasets prescribed in Annex A for common upstream energy and materials to improve the consistency and comparability of EPDs developed under this PCR.

7.1.9.2.3 Transparency of life cycle inventories

Background inventory data sources at the flow and database level shall be declared on the EPD. The EPD shall include a table outlining the primary sources of data used to complete the upstream material LCI background data including the data source name, source, specificity of the data source (industry average, manufacturer average, facility-specific, proxy data, generic data), and year on which the data was based, date or version number. The table outlining primary sources of data shall only list the data sources utilized in the EPD.

[22] Intergovernmental Panel on Climate Change, UN Environment Programme. C/o World Meteorological Organization, 7 bis Avenue de la Paix, CP 2300, CH-1211 Geneva 2, Switzerland. <ipcc.ch>

7.1.9.2.4 Geography and regionalization

The upstream data specified in Annex A are specific to North America. US baseline inventories for electricity shall be regionalized at the balancing authority level (see Annex A for details). Canadian baseline inventories for electricity shall be regionalized at the Provincial level.

7.1.9.2.5 Data gaps

Data gap identification shall be performed as described in the ACLCA *Guidance* [6] for background dataset selection. Data gaps shall be described in the EPD and the following statement should appear:

> *"Data for [list of materials] was not available at time of EPD preparation and may have effects on total impacts."*

7.1.9.2.6 Updating prescribed inventory data

The Concrete PCR Committee should convene at intervals no greater than 24 mo, but shall convene at least once every 5 yr, consistent with Section 6 to review upstream datasets to determine whether any changes should be made to Annex A. Any resulting revision of Annex A based on this review shall be summarized in the Summary of Changes section of Annex A and shall include the date of revision. The PCR's date of expiry shall not be affected by mid-cycle revisions of Annex A data.

7.1.9.3 Portable equipment

Portable equipment to produce concrete mixes at a project site, such as, but not limited to portable wet batch plants and portable dry batch plants shall be modeled using the following rules for data collection:

- regionalized data for energy and raw materials for the location indicated in the EPD. Mobilization of the portable equipment to the location indicated in the EPD reported under Module A3, only if materials and energy impacts associated with transportation for mobilization are greater than 1% of the total impacts reported in Modules A1 to A3 in the EPD
- average operations based on an inventory of energy, consumables, emissions and waste and the produced volume, for 12 consecutive months beginning within 2 yr of the publication date of the EPD. For new portable equipment without 12 mo of data, proxy data taken from the same or similar facilities/equipment installed in similar conditions. The use of proxy data shall be declared in the EPD. This data should be updated within 12 mo of the publication date, or when 12 mo of consecutive data becomes available, the updated EPD ID or version number shall be updated. Once 12 consecutive months of primary data at the portable equipment's current location has been incorporated, the update requirements of Section 7.1.9 take over, which state the 12-mo reporting period shall begin within 5 yr of the EPD issue date (i.e. data expires 4 yr after the end of the reporting). The transportation distance and mode for raw materials to the location indicated in the EPD for the declared concrete mix.
- EPDs for portable equipment are only considered valid for the location and the period that the mix is produced at the location indicated in the EPD
- A4 is anticipated to be zero for portable equipment.

7.1.10 Units

Per ISO 21930:2017 [1] Clause 7.1.10, with the following additions.

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

Table 4
SI conversions

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
gallon (gal)	liter (L)	3.78541 E-00
fluid ounce (oz)	milliliter (mL)	29.5735 E-00

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

7.2 Inventory analysis

Per ISO 21930:2017 [1] Clause 7.2, with the following clarifications.

This PCR recognizes that the following materials shall be considered recovered materials:

- coal ash
- silica fume
- blast furnace slag.

Note. References to blast furnace slag as a recovered material apply solely to unprocessed slag at the point of generation from iron production. Any subsequent processing or transformation of blast furnace slag—including but not limited to GBFS, GGBFS, pelletized slag, or other derivative products—shall include all relevant environmental burdens associated with processing, handling, transport, and manufacturing in Modules A1 to A3, as applicable.

Concrete recycling processes may be treated as closed-loop recycling when the recycled concrete is used as a material input for the production of concrete. In this case only the flows and impacts associated with transportation, recovery and crushing of the recycled concrete [23] 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 the EPD.

Where potable water from a municipal source is used, the water treatment and distribution systems shall be included as an upstream process, which shall have its own resource use and discharges. The impacts of water desalination shall be included.

7.2.1 Data collection

Per ISO 21930:2017 [1] Clause 7.2.1.

[23] RAC is addressed in the Construction Aggregates PCR and should be referenced. See Annex A.

7.2.2 Calculation procedures

Per ISO 21930:2017 [1] Clause 7.2.2.

7.2.3 Allocation situations

Per ISO 21930:2017 [1] Clause 7.2.3.

7.2.4 Principles for allocation for both allocation situations

Per ISO 21930:2017 [1] Clause 7.2.4.

7.2.5 Allocation for co-products

7.2.5.1 General

Per ISO 21930:2017 [1] Clause 7.2.5.1.

7.2.5.2 Co-product allocation procedure

Per ISO 21930:2017 [1] Clause 7.2.5.2.

7.2.5.3 Avoiding allocation generally

Per ISO 21930:2017 [1] Clause 7.2.5.3.

7.2.5.4 Allocation by subdivision

Per ISO 21930:2017 [1] Clause 7.2.5.4.

7.2.6 Allocation between product systems (across the system boundary)

Per ISO 21930:2017 [1] Clause 7.2.6.

7.2.7 Accounting of biogenic carbon update and emissions during the life cycle

Per ISO 21930:2017 [1] Clause 7.2.7.

The accounting methodology in ISO 21930:2017 Clause 7.2.7 applies to all biogenic-based materials used in concrete.

7.2.8 Carbonation

This clause of ISO 21930:2017 [1] does not apply.

7.2.9 Accounting of delayed emissions

This clause of ISO 21930:2017 [1] does not apply.

7.2.10 Inventory indicators describing resource use

Per ISO 21930:2017 [1] Clause 7.2.10.

7.2.11 Greenhouse gas emissions from land use change

Per ISO 21930:2017 [1] Clause 7.2.11.

7.2.12 Additional inventory indicators describing emissions and removal of carbon

Per ISO 21930:2017 [1] Clause 7.2.12.

Note that ISO 21930:2017 Clause 7.2.12 requires the reporting of additional inventory indicators in the following cases:

- biogenic CO_2, reporting the removals and emissions associated with biogenic carbon content contained within bio-based products, occurring in each declared module
- CO_2 from calcination and carbonation, reporting the emissions and uptake of CO_2 from calcination and carbonation occurring in the relevant declared module
- biogenic CO_2, reporting the emissions from combustion of waste from renewable sources used in production processes
- CO_2 emissions from combustion of waste from non-renewable sources used in production processes.

7.2.13 Inventory indicator describing consumption of freshwater

Per ISO 21930:2017 [1] Clause 7.2.13.

7.2.14 Environmental information describing waste categories and output flows

Per ISO 21930:2017 [1] Clause 7.2.14, with the following clarification.

This PCR recognizes coal ash, silica fume, and blast furnace slag as recovered materials.

7.3 Impact assessment indicators describing main environmental impacts derived from LCA

Per ISO 21930:2017 [1] Clause 7.3, with the following clarification.

The impact assessment shall include all of the inventory items included in Section 7.2.12. The environmental impacts shall be calculated based on characterization factors from the IPCC AR5 [22] for global warming potential, or most recent:

- Global Warming Potential – Total (GWP-total)
- Global Warming Potential – Fossil (GWP-fossil)
- Global Warming Potential – Biogenic (GWP-biogenic)
- Global Warming Potential – Land Use and Land Use Change (GWP-luluc).

TRACI 2.2 [12] shall be used for the other impacts. In cases where biogenic carbon is present in the system, GWP with and without biogenic shall be reported.

8 Additional environmental information

Per ISO 21930:2017 [1] Clause 8, with the following clarification.

Additional information shall only be related to environmental aspects. Information and instructions on product safety unrelated to the environmental performance of the building product shall not be part of a Type III EPD (ISO 14025:2006).

8.1 General

Per ISO 21930:2017 [1] Clause 8.1.

8.2 Additional LCA related Information not included in preset LCIA indicators

Per ISO 21930:2017 [1] Clause 8.2.

8.3 Additional environmental information not derived from or related to LCA

Per ISO 21930:2017 [1] Clause 8.3.

8.4 Mandatory additional environmental information

Per ISO 21930:2017 [1] Clause 8.4.

Note. ISO 21930:2017 Clause 8.4.1 includes requirements for hazardous materials reporting.

9 Content of an EPD

Note that all reporting requirements detailed in this PCR shall be included in the content of the EPD.

9.1 General

Per ISO 21930:2017 [1] Clause 9.1.

9.2 Declaration of general information

Per ISO 21930:2017 [1] Clause 9.2, with the following clarifications:

- a simple visual representation of concrete is not relevant and thus not required
- as the percentage of material components can be considered proprietary information, the list of materials should be reported in order of greatest mass per mix
- include the non-optional contents of the following table:

Table 5
Demonstration of verification

Product name	
Manufacturer name and address	
Specified compressive strength and cure time (hours or days)	
Early strength @ timeframe	
Late strength @ timeframe (optional)	
Lightweight Concrete (y/n)	
Plant name and address *	
Portable equipment (y/n) (optional)	
Program operator	
General program instructions and version number	
EPD unique ID and version	
Reference PCR and version number	
EPD type and scope (include all applicable) ☐ facility-specific, ☐ industry-average, ☐ manufacturer-average, ☐ product-average, ☐ product-specific)	
EPD scope (specify A1 to A3 or A1 to A4)	
If portable equipment, indicate if proxy data was used (optional)	
Defined functional or declared unit	
Geographic market	
Product's intended application and use	
Markets of applicability	
Date of issue	
Period of validity	
Year of reported manufacturer primary data	
Known data gaps	

EPD Tool Developer	
LCA software and version number	
LCI database and version number	
LCIA methodology and version number	
The sub-category PCR review was conducted by:	
This declaration was independently verified in accordance with ISO 14025:2006. ISO 21930:2017 serves as the core PCR. Sub-category PCR: **NSF Concrete** Product Category Rule ☐ Internal ☐ External	
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	
Explanatory material can be obtained from the following:	

* Address associated with the facility at which the product reflected in the EPD was produced, i.e. not the corporate office address of the parent company.

- include the content of the following table:

Tool developer	
EPD owner	
Date published	
Producer’s mix ID	
EPD unique ID	
EPD version number for this mix ID	

The EPD Unique Identifier shall be assigned by the Tool Developer/LCA Producer, at most 12 alphanumeric characters with the first three characters in each unique identifier being linked to the specific tool developer and assigned by the program operator. For example, Tool Developer ABC may use abc0123456 and continue sequentially numbering and Tool Developer XYZ may use xyz000001. When a new EPD is developed for the same concrete mixture, the EPD shall either be assigned a new unique ID or the version number increased by one.

Table 2, which reports performance characteristics information, shall be included in the EPD, where the column for "Value Type" is replaced with "Value," and the value for a given field is reported.

9.3 Declaration of the methodological framework

Per ISO 21930:2017 [1] Clause 9.3, with the following additions and clarifications.

The EPD shall include the following:

- a table summarizing the life cycle stages and modules within them, included in the EPD:

Table 6
Mandatory life stages included in the EPD

Production stage			Construction stage		Use stage							End-of-life stage				Benefits and loads beyond the system boundary
Raw material extraction	Transport	Manufacturing	Transportation to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operation energy use	Operation water use	De-construction	Transport	Waste processing	Disposal	Reuse/recycle
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	O	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Note. MND = module not declared, X = module declared, O = optional declaration

Note. Module A4 is shown in this example table as optional. The table shown in the published EPD shall indicate "X" or "MND" dependent on inclusion of the module in the published data.

- a table outlining the primary sources of data used to complete the upstream material LCI background data including the date or version number shall be specific to the product(s) reported in the EPD. To protect proprietary information, the specific EPD does not need to be listed
- for industry average EPDs, include the following information within the EPD itself:
    - date and source of industry data survey including a list of all companies who participated in the EPD data
    - impacts from Modules A1, A2, and A3 reported separately as well as in total A1 to A3. If Module A4 is reported, it shall be reported separately
    - identification of the product type, based on the applicable products listed within this PCR
    - outline the market coverage (i.e. the representativeness of the EPD)
    - indication if the EPD is production volume weighted or not
    - a statistical analysis, including the mean, standard deviation, median, quintile distribution, level of confidence (including margin of effort), confidence interval for GWP, AP, EP, ODP, and POCP, the number of data points (sample size) used in the calculation per product type identified. Additionally, explicitly state which statistical distribution is being used (e.g. normal, exponential) along with the justification for use of that distribution. Lastly, include a description of the effect of any missing data on the results.
- one of three statements, addressing GWP 100 (years), ODP, EP, AP, and POCP impact categories:
    - *"This EPD was calculated using industry average cement data. Cement LCA impacts can vary significantly depending upon manufacturing process, efficiency and fuel."*
    - *"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."*
- the reference Annex A version (e.g. version 1, July 2025) shall be reported
- The most recent version of Annex A as of the date of EPD publishing shall be used.

9.4 Declaration of technical information and scenarios

ISO 21930:2017 [1] Clause 9.4 does not apply for EPDs limited to A1 to A4. Note that the performance characteristics listed in Table 2 shall be included in the EPD.

9.5 Declaration of environmental indicators derived from LCA

Per ISO 21930:2017 [1] Clause 9.5, with the following additions.

The following additional LCA results shall be included in the EPD:

- Global Warming Potential – Total (GWP-total)
- Global Warming Potential – Fossil (GWP-fossil)
- Global Warming Potential – Biogenic (GWP-biogenic)
- Global Warming Potential – Land Use and Land Use Change (GWP-luluc)

- ADP for non-fossil mineral resources (ADP elements).

The following clarifications shall be applied and statements added:

- many of the impacts and inventory items included in ISO 21930:2017 are emerging and have high levels of uncertainty
- renewable primary energy resources as energy (fuel), (RPR_E)
- renewable primary resources as material, (RPR_M)
- non-renewable primary resources as energy (fuel) ,($NRPR_E$)
- non-renewable primary resources as material ($NRPR_M$)
- secondary materials (SM)
- renewable secondary fuels (RSF)
- non-renewable secondary fuels (NRSF)
- recovered energy (RE)
- ADP for non-fossil mineral resources (ADP elements)
- land use related impacts, for example on biodiversity and/or soil fertility
- toxicological aspects
- hazardous waste disposed [24]
- non-hazardous waste disposed
- high-level radioactive waste
- intermediate and low-level radioactive waste
- components for reuse
- materials for recycling
- materials for energy recovery
- RE exported from the product system.

When upstream data specified in the PCR and/or used in calculating the EPD do not have data for select impact categories or inventory items, they shall be reported as an "x" or "-" and not zero and qualified with the note:

> *"Not all upstream LCA datasets include these impact categories and thus results may be incomplete. Use caution when interpreting data in these categories."*

When EACs are procured, market-based accounting of impact indicators in the quantification of impacts section of an EPD shall be disclosed and may be reported in the "Additional Environmental Information" section of the EPD.

[24] As defined by RCRA under 40 CFR 261.33. <govinfo.gov/content/pkg/CFR-2011-title40-vol26/pdf/CFR-2011-title40-vol26-sec261-33.pdf>

9.6 Declaration of additional environmental information

Per ISO 21930:2017 [1] Clause 9.6, with the following additions:

The following optional additional information may be reported as a separate inventory item:

- carbon sequestered in a product (kg) that is not already documented per Section 7.2.12. Methodology should be documented and publicly reported.

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

- ISO 21930:2017, *Sustainability in Building Construction – Environmental Declaration of Building Products*
- NSF 1112-26, *Concrete Product Category Rules, v3.0*
- NSF, *Product Category Rules Program General Program Instructions*. [10]

10 Project report

Per ISO 21930:2017 [1] Clause 10, with the following additions.

EPDs for concrete that are developed using a verified software tool do not need an individual project report for each EPD. Instead, the underlying project report for the software tool may serve as the project report for the EPD. The underlying project report for the software tool shall conform to the requirements of Section 10 and ISO 21930:2017.

The generation of digital EPDs is encouraged under this PCR.

11 Verification and validity of an EPD

Per ISO 21930:2017 [1] Clause 11, with the following additions:

- EPD calculations completed by software systems are permitted provided the software has been verified by similar procedures as verifying an EPD. The process used to verify the software calculations shall be publicly accessible and referenced from the EPD
- when a product-specific EPD is intended to be considered comparable with an industry-average EPD, the following additional items are required:
    - in order to evaluate the consistency of results between product-specific EPDs and industry average EPDs either:
        - the same LCA modeling software and version and background data shall be used to create the EPD
        - the LCA modeling software and version shall test representative samples of the regionally-specific industry average benchmark data and include in the EPD a report of the maximum percent difference for environmental impact categories: GWP, AP, ODP and smog creation potential. If a different LCA tool is selected, it shall be used to calculate environmental indicators for a sample of representative mixes taken from the published industry 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 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.

- an EPD shall be recalculated when its period of validity is complete or when significant changes to the EPD results. Significant changes are an increase or decrease of GWP 100 by more than 5% of previously reported value as a result of changes to manufacturing practices or material suppliers, or within 12 mo of updates to the PCR or Annex A
- errors and omissions found after publication shall require recalculation and publication of a revised EPD regardless of the impact of the error or omission.

When a product-specific EPD is aligned with an industry-average EPD, the following additional item shall be required:

- In order to evaluate the consistency of results between product-specific EPDs and industry-average EPDs, the same LCA background data set and characterization model shall be used to create the EPD.

12 References

At the time this PCR was balloted, the editions listed below were valid. All documents are subject to revision, and parties are encouraged to investigate the possibility of applying the recent editions of the documents indicated below. The most recently published edition of the document shall be used for undated references.

12.1 ASTM standards

ASTM A36/A36M, *Standard Specification for Carbon Structural Steel* [3]

12.2 CSA standards

CAN/CGSB-1.40, *Anticorrosive Structural Steel Alkyd Primer* [4]

CAN/CSA A23.4, *Precast concrete – Materials and construction* [4]

CAN/CSA G30.18, *Carbon steel bars for concrete reinforcement* [4]

CAN/CSA G40.20/G40.21, *General requirements for rolled or welded structural quality steel/Structural quality steel* [4]

CSA S806, *Design and construction of building structures with fibre-reinforced polymers* [4]

12.3 EN standards

EN 16757, *Sustainability of construction works – Environmental product declarations – Product Category Rules for concrete and* concrete *elements* [14]

EN 15804, *Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products* [14]

12.4 ISO standards

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

ISO 14021:1999, *Environmental Labels and Declarations – Self-declared Environmental Claims (Type II Environmental Labeling)* [1]

ISO 14067:2018, *Greenhouse Gases – Carbon Footprint of Products – Requirements and Guidelines for Quantification* [1]

ISO 14050:2009, *Environmental Management – Vocabulary* [1]

12.5 Other references

ACI 318-25, *Building Code Requirements for Structural Concrete and Commentary* [25]

ACLCA, *Open Standard – Process and Methods Toolkit* (2022) [6]

ASTM, *Product Category Rules for Environmental Product Declarations for Slag Cement, v2.0 (UNCPC 3744)* [26]

Mather, B. & Ozyildirim, C. (2002). SP-1(02): *Concrete Primer*. American Concrete Institute: SP0102 [16]

NSF/ASTM 1126-23, *Product Category Rules for Environmental Product Declarations for Construction Aggregates, v2 with Errata* [27]

NSF/ASTM, *Product Category Rules for Environmental Product Declarations for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements* [27]

NSF/ASTM, *Product Category Rules for Environmental Product Declarations for Precast Concrete, v3.0 (UNCPC 37550)* [27]

Smart EPD, Part B Product Category Rules for Cements For Construction, Standard 1000-010, version 4, July 2, 2025 [26]

Smart EPD, Part B Product Category Rules for Supplementary Cementitious Materials, Standard 1000-002, version 1.0, May 7, 2024 [26]

USGBC, *LEED v4.1 for Building Design and Construction*, 11 Jan 2019 [28]

USGBC, *PCR Committee Process & Resources: Part B*, 7 July 2017 [28]

US EPA, *Coal Ash (Coal Combustion Residuals)* [29]

[25] American Concrete Institute. 38800 Country Club Drive, Farmington Hills, MI 48331. <concrete.org>

[26] Smart EPD LLC. 585 Grove Street, Suite 145 PMB 966, Herndon, VA 20170. <smartepd.com>

[27] NSF Product Category Rules. <nsf.org/nsf-standards/product-category-rules>

[28] United States Green Building Council. 2101 L Street NW, Suite 600, Washington, DC 20037. <usgbc.org>

[29] Coal Combustion Residuals, US Environmental Protection Agency. 1200 Pennsylvania Avenue NW, Washington, DC 20004. <epa.gov/coal-combustion-residuals>

Annex A

Default data sources – Version 1, July 2025

The default LCA/LCI data noted in Table 7 shall be used unless manufacturer- and product-specific EPD results are available. Tables 8 and 9 shall be used for all applications unless an alternate standardized regional database is published as a clarification to the *PCR for Concrete* to enable more accurate yet still standardized upstream LCA data. If a newer version of any referenced EPD or any new industry average covering new materials becomes available, it shall be used instead.

In order to align with EN 16757[14] and provide greater clarity on developing methodology, the following characterization factors are defined in Table 10. 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 7
Material data

Materials	Default LCA/LCI data	Year/Region	PCR
	North American-produced cement		

Cements:
• portland cement
• portland-limestone cement
• blended cements
• performance-based hydraulic cement
• hydraulic cement
	The following data hierarchy shall be followed for applicable cements:
	• Product- and facility-specific EPDs are required to be used when they are available and are the preferred data source. If total emissions are reported it should be used.
	• Regional-average EPDs are the next preferred data source.
	• National-average EPDs are the next preferred data source.
	• Use of an LCI dataset for the modeling of cement impacts within a concrete mix EPD shall not be used. All cement impacts within a concrete mix EPD shall be based on EPDs that conform to the most recent North American Cement PCR. (A published EPD is not invalidated by the publication of a new PCR.)
		Year of reporting shall be included in the product- and facility-specific EPD that is being used within the Concrete Mix EPD.
		
		ACA national averages:
		• 2023, unless a more recent version is published by the ACA, then it shall be used.
		
		CSA regional averages:
		• 2023, unless a more recent version is published by the Cement Association of Canada, then it shall be used
		
		Mexico national averages:
		• TBD
			Smart EPD, *Part B Product Category Rules for Cements for Construction – Standard 1000-010, version 4, July 2, 2025* [a]
			
			Averages for:
			• United States: [b]
			  ○ portland cement [c]
			  ○ portland limestone cement [d]
			• Canada [e]
			• Mexico:
			  ○ TBD (not yet available)

[a] Smart EPD LLC. 585 Grove Street, Suite 145 PMB 966, Herndon, VA 20170. <smartepd.com>
[b] American Cement Association. 200 Massachusetts Ave NW, Suite 200, Washington, DC 20001. <cement.org>
[c] <pcr-epd.s3.us-east-2.amazonaws.com/634.EPD_for_Portland_Athena_Final_revised_04082021.pdf>
[d] <pcr-epd.s3.us-east-2.amazonaws.com/635.EPD_for_PLC_Athena_Final_revised_04082021.pdf>
[e] Cement Association of Canada. 1105-350 Sparks Street, Ottawa, ON K1R 7S8, Canada. <cement.ca>

Table 7
Material data

Materials	Default LCA/LCI data	Year/Region	PCR
	Cement produced outside of North America		

Cements:
• portland cement
• portland-limestone cement
• blended cements
• performance-based hydraulic cement
• hydraulic cement
	The following data hierarchy shall be followed for applicable cements:
	• Product- and facility-specific EPDs are required to be used when they are available and are the preferred data source, to yield a product- and facility-specific concrete EPD. The product- and facility-specific EPD shall comply with the North American cement PCR.
	• Regional-average EPDs are the next preferred data source. The EPD shall comply with the North American cement PCR.
	• National-average EPDs are the next preferred data source. The EPD shall comply with the North American cement PCR.
	• If a product- and facility-specific EPD is not available for cement produced outside of North America, then the ACA industry average EPD value shall be used for the relevant cement type.
	• Use of an LCI dataset for the modeling of cement impacts within a concrete mix EPD shall not be used. All cement impacts within a concrete mix EPD shall be based on EPDs that conform to the most recent North American Cement PCR. (A published EPD is not invalidated by the publication of a new PCR.)
		Year of reporting shall be included in the product- and facility-specific EPD that is being used within the Concrete Mix EPD.
		
		ACA national averages:
		• 2023, unless a more recent version is published by the ACA, then it shall be used.
		
		CSA regional averages:
		• 2023, unless a more recent version is published by the Cement Association of Canada, then it shall be used
		
		Mexico national averages:
		• TBD
			Smart EPD, *Part B PCR for Cements for Construction version 4, July 2025* [a]
			
			Averages for:
			• United States: [b]
			  ○ portland cement [c]
			  ○ portland limestone cement [d]
			• Canada [e]
			• Mexico:
			  ○ TBD (not yet available)

[a] Smart EPD LLC. 585 Grove Street, Suite 145 PMB 966, Herndon, VA 20170. <smartepd.com>
[b] American Cement Association. 200 Massachusetts Ave NW, Suite 200, Washington, DC 20001. <cement.org>
[c] <pcr-epd.s3.us-east-2.amazonaws.com/634.EPD_for_Portland_Athena_Final_revised_04082021.pdf>
[d] <pcr-epd.s3.us-east-2.amazonaws.com/635.EPD_for_PLC_Athena_Final_revised_04082021.pdf>
[e] Cement Association of Canada. 1105-350 Sparks Street, Ottawa, ON K1R 7S8, Canada. <cement.ca>

Table 7
Material data

Materials	Default LCA/LCI data	Year/Region	PCR
Aggregate (Per Table 1.1 of NSF *PCR for Construction Aggregates*): • ASTM C33/C33M, *Standard Specification for Concrete Aggregates* • ASTM C125, *Standard Terminology Relating to Concrete* • ASTM C144, *Standard Specification for Aggregate for Masonry Mortar* • ASTM C637, *Standard Specification for Aggregates for Radiation-Shielding Concrete* • ASTM C1797, *Standard Specification for Ground Calcium Carbonate and Aggregate Mineral Fillers for Use in Hydraulic Cement Concrete*	The following data hierarchy shall be followed for applicable aggregates: • Product- and facility-specific EPDs shall be used when they are available and are the preferred data source. • Facility-specific and product-average EPDs are the next preferred data source and shall be used when they are available. • National-average EPDs are the next preferred data source. • NSSGA LCA Data is the next preferred data source: ○ Crushed aggregates may be conservatively reclassified as exploded/washed aggregates. ○ Natural aggregates may be conservatively reclassified as non-exploded/washed aggregates. The following may be used if the previous data sources are not available: • ecoinvent 3.10: "Gravel, crushed {RoW}| production | Alloc Rec" LCAs outside of the United States if the previous four data sources are not available or determined as not applicable, dependent upon the availability of improved datasets within the Federal LCA. • Federal LCA Commons by 1/1/2026, this PCR shall be updated to reflect such free-to-use and publicly available datasets for the United States.	Year of reporting shall be included in the product- and facility-specific EPD that is being used within the Concrete Mix EPD. National-average EPDs for the United States: • TBD (not yet available) NSSGA LCA [b] ecoinvent data: • 2001, World	NSF, *PCR for Construction Aggregates, 2023* [c] *Note.* When using ecoinvent dataset, replace electricity with US data and follow allocation approach outlined in Aggregate PCR.

[a] Per Table 1.1 of NSF *PCR for Construction Aggregates*.

[b] National Stone, Sand & Gravel Association. 66 Canal Center Plaza, Suite 300, Alexandria, VA 22314. <nssga.org>

[c] NSF Product Category Rules. <nsf.org/nsf-standards/product-category-rules>

Table 7
Material data

Materials	Default LCA/LCI data	Year/Region	PCR
Aggregate (Per Table 1.1 of NSF *PCR for Construction Aggregates*): • CSA A23.1/A23.2, *Concrete materials and methods of concrete construction* • Lightweight aggregates (per ASTM C330)	The following data hierarchy shall be followed for applicable aggregates: • Product- and facility-specific EPDs shall be used when they are available and are the preferred data source. • Upon the availability of improved datasets within the Federal LCA Commons by 1/1/2026, this PCR shall be updated to reflect such free-to-use and publicly available datasets for the United States. ecoinvent 3.10: "expanded clay production | expanded clay | Cutoff, U – RoW"	Year of reporting shall be included in the product- and facility-specific EPD that is being used within the Concrete Mix EPD. National-average EPDs for the United States: • TBD (2025 publication expected) Industry-wide LCA: • TBD (not yet available) ecoinvent data: • 1995 to 2023	ULE 10010-37, *PCR for Construction Product-Related Products and Services: Part B Expanded Shale, Clay, and Slate Lightweight Aggregates EPD Requirements* [a] Expanded Shale, Clay and Slate Institute (ESCSI): • Short report – GWP impact [b] • Technical sheet for GWP impact of LW aggregates only [c]

[a] UL Environment. 333 Pfingsten Road, Northbrook, IL 60062. <ul.com>

[b] Expanded Shale, Clay and Slate Institute. 405 Battleground Avenue, Suite 204, Greensboro, NC 27401. <escsi.org>

[c] ESCI, *Technical Information Sheet: Environmental Footprints for the Production Process of Expanded Shale, Clay, and Slate (ESCS) Lightweight Aggregates*. <escsi.org>

Table 7
Material data

Materials	Default LCA/LCI data	Year/Region	PCR
SCMs (per Table 2 of SCM PCR) and Slag Cement: • coal ash (ASTM C618, Class C and F, AASHTO M 295, CSA A3001, NMX-C-179) • SCMs • natural pozzolans (ASTM C618, AASHTO M 295, CSA A3001,NMX-C-179) • SCMs – silica fume (ASTM C1240, AASHTO M307, CSA A3001, NMX-C-1240) • ground glass pozzolan (ASTM C1688) CSA A3001 • blended SCMs (ASTM C1697) - Not included Slag CSAA3001 • alternative SCMs (ASTM C1709) • SCMs without an existing consensus specification	The following data hierarchy shall be followed for SCMs and Slag Cements: • Product- and facility-specific EPDs shall be used when they are available and are the preferred data source. • National-average EPDs are the next preferred data source. • Industry-wide LCA data is the next preferred data source • If none of the above exists, the use of free-to-use and publicly accessible datasets is the next preferred data source. • For other ground SCM, A-3 of the Slag Cement EPD shall be used. Upon the availability of improved datasets within the Federal LCA Commons by 1/1/2026, this PCR shall be updated to reflect such free-to-use and publicly available datasets for the United States.	Year of reporting shall be included in the product- and facility-specific EPD that is being used within the Concrete Mix EPD. National-average EPDs for the United States: • TBD (not yet available) National-average EPDs for Canada: • TBD (not yet available) National-average EPDs for Mexico: • TBD (not yet available) Industry-wide LCA for the United States: • TBD (not yet available) Industry-wide LCA for Canada: • TBD (not yet available) Industry-wide LCA for Mexico: • TBD (not yet available) Unless a more recent industry-wide EPD becomes available from the relevant association, the data hierarchy listed here shall be followed.	Smart EPD, *Part B Product Category Rules for Supplementary Cementitious Materials – Standard 1000-002, version 1.0, May 7, 2024* [a]

[a] Smart EPD LLC. 585 Grove Street, Suite 145 PMB 966, Herndon, VA 20170. <smartepd.com>

Table 7
Material data

Materials	Default LCA/LCI data	Year/Region	PCR
SCMs (per Table 2 of SCM PCR) and Slag Cement: • SCMs – Ground granulated blast furnace slag cement (ASTM C989, CSA A3001)	The following data hierarchy shall be followed for applicable SCMs: • Product- and facility-specific EPDs shall be used when they are available and are the preferred data source. • National-average EPDs provided by the SCA are the next preferred data source. [a] • ESCSI industry-wide LCA data is the next preferred data source. [b]	Year of reporting shall be included in the product- and facility-specific EPD that is being used within the Concrete Mix EPD. National-average EPDs for North America: • 2021, North America National-average EPDs for Canada: Unless a more recent version is published by the SCA, then it shall be used.	Smart EPD, *Part B Product Category Rules for Cements for Construction – Standard 1000-010, version 4, July 2, 2025* [c] NSF/ASTM, *Product Category Rules for Environmental Product Declarations for Slag Cement, v2.0, December 2020 (UNCPC 3744)* [d]

[a] Slag Cement Association. 38800 Country Club Drive, Farmington Hills, MIU 48331. <slagcement.org>
[b] Expanded Shale, Clay and Slate Institute. 405 Battleground Avenue, Suite 204, Greensboro, NC 27401. <escsi.org>
[c] Smart EPD LLC. 585 Grove Street, Suite 145 PMB 966, Herndon, VA 20170. <smartepd.com>
[d] NSF Product Category Rules. <nsf.org/nsf-standards/product-category-rules>

Table 7
Material data

Materials	Default LCA/LCI data	Year/Region	PCR
Water	ecoinvent 3.4: “Tap water {RoW} | market for | Cutoff, adjusted for the electricity grid for the region of interest.” Upon the availability of improved datasets within the Federal LCA Commons by 1/1/2026, this PCR shall be updated to reflect such free-to-use and publicly available datasets for the United States. 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.	ecoinvent: 2012-2023	None

Table 7
Material data

Materials	Default LCA/LCI data	Year/Region	PCR
Admixtures • Chemical admixtures	The following data hierarchy shall be followed for applicable admixtures: • Product- and facility-specific EPDs shall be used when they are available and are the preferred data source. • National-average EPDs are the next preferred data source. • Industry-wide LCA data is the next preferred data source. • If none of the above exists, the use of free-to-use and publicly accessible datasets is the next preferred data source. Upon the availability of improved datasets within the Federal LCA Commons by 1/1/2026, this PCR shall be updated to reflect such free-to-use and publicly available datasets for the United States. Due to limited data availability of the above options in the hierarchy, if no data exists, the most recent EPD from EFCA shall be used. [a]	Year of reporting shall be included in the product- and facility-specific EPD that is being used within the Concrete Mix EPD.	NSF 1129-26, *Product Category Rule for Environmental Product Declarations – Concrete Admixtures, Version 1.0* [b]

[a] European Federation of Concrete Admixtures Associations. Rue d'Arlon 55, 1040 Brussels, Belgium. <efca.info>

[b] NSF Product Category Rules. <nsf.org/nsf-standards/product-category-rules>

Table 7
Material data

Materials	Default LCA/LCI data	Year/Region	PCR
Novel materials • novel cements • novel aggregates	For novel materials that seek to replace a material category that is identified above within this table, a product and facility specific EPD shall be created following the most recent applicable PCR for the material category it is seeking to replace (see right column). The following considerations shall be followed as a part of this process: • Confirm that the novel material is not covered by the most recent North American PCR (see right column). • If the novel material is captured under the most recent North American PCR (see right column), that PCR shall be used and followed to create a product- and facility- specific EPD for use as the default LCA data within a concrete mixture. • If the novel material is not covered by the most recent North American PCR (see right column), conduct an LCA compliant to ISO 14044:2006, produce an EPD compliant to ISO 14025:2006 and ISO 21930:2017, and follow the North American PCR (see right column) as closely as possible. ○ For allocation, EPD information, and electricity data, follow the most recent North American PCR (see right column). ○ Any differences or divergence from the North American PCR (see right column) shall be identified via the cover sheet of the resulting EPD ○ If an EPD is developed per ISO 21930:2017, and 12 consecutive months of manufacturer-specific data is not available, the EPD shall report the time period (duration and starting and ending month) of production data used.	Year of data shall be included in the product- and facility-specific EPD associated with the novel cement.	Novel cements: • Smart EPD, *Part B Product Category Rules for Cements for Construction – Standard 1000-010, version 4, July 2, 2025* [a] Novel aggregates: • Construction aggregates: ○ NSF, *PCR for Construction Aggregates, 2023* [b] *Note.* When using ecoinvent dataset, replace electricity with US data and follow allocation approach outlined in Aggregate PCR. • ESCSI aggregates: ○ ULE 10010-37, *PCR for Construction Product-Related Products and Services: Part B Expanded Shale, Clay, and Slate Lightweight Aggregates EPD Requirements:*

[a] Smart EPD LLC. 585 Grove Street, Suite 145 PMB 966, Herndon, VA 20170. <smartepd.com>
[b] NSF Product Category Rules. <nsf.org/nsf-standards/product-category-rules>
[c] UL Environment. 333 Pfingsten Road, Northbrook, IL 60062. <ul.com>

Table 7
Material data

Materials	Default LCA/LCI data	Year/Region	PCR
Novel materials • novel SCMs (cementitious materials) • novel admixtures • other materials	For novel materials that seek to replace a material category that is identified above within this table, a product and facility specific EPD shall be created following the most recent applicable PCR for the material category it is seeking to replace (see right column). The following considerations shall be followed as a part of this process: • Confirm that the novel material is not covered by the most recent North American PCR (see right column). • If the novel material is captured under the most recent North American PCR (see right column), that PCR shall be used and followed to create a product- and facility- specific EPD for use as the default LCA data within a concrete mixture. • If the novel material is not covered by the most recent North American PCR (see right column), conduct an LCA compliant to ISO 14044:2006, produce an EPD compliant to ISO 14025:2006 and ISO 21930:2017, and follow the North American PCR (see right column) as closely as possible. ○ For allocation, EPD information, and electricity data, follow the most recent North American PCR (see right column). ○ Any differences divergence from the North American PCR (see right column) shall be identified via the cover sheet of the resulting EPD ○ If an EPD is developed per ISO 21930:2017, and 12 consecutive months of manufacturer-specific data is not available, the EPD shall report the time period (duration and starting and ending month) of production data used.	Year of data shall be included in the product- and facility-specific EPD associated with the novel cement.	Novel SCMs: • Smart EPD, *Part B Product Category Rules for Cements for Construction – Standard 1000-010, version 4, July 2, 2025* [a] Novel admixtures: • NSF, *PCR for Construction Aggregates, 2023* [b] Other materials: • ISO 21930:2017: *Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services* [c]

[a] Smart EPD LLC. 585 Grove Street, Suite 145 PMB 966, Herndon, VA 20170. <smartepd.com>

[b] NSF Product Category Rules. <nsf.org/nsf-standards/product-category-rules>

[c] International Organization for Standardization. Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland. <iso.org>

Table 8
Transportation data

Transportation mode		Default LCI data	Data collection year/Region	Notes
Land	road: combination truck	Transport, combination truck; long-haul; diesel powered/tkm/RNA [a]	2010/US	Long-haul trips are greater than 200 mi (322 km), while short-haul trips are 200 mi (322 km) or less. All data is free-to-use and publicly accessible via the links provided to the Federal LCA Commons' USLCI Database.
		Transport, combination truck; short-haul; diesel powered/tkm/RNA [b]		
		Transport, combination truck; short-haul; gasoline powered/tkm/RNA [c]		
	road: single unit truck	Transport, single unit truck; long-haul; diesel powered/tkm/RNA [d]		
		Transport, single unit truck; long-haul; gasoline powered/tkm/RNA [e]		
		Transport, single unit truck; short-haul; diesel powered/tkm/RNA [f]		
		Transport, single unit truck; short-haul; gasoline powered/tkm/RNA [g]		
	rail	Transport, train, diesel powered/tkm/US [h]	2012/US	USLCI Database. (Summer 2024 release). NREL, 2012. Accessed July 30, 2024. [l] All data is free-to-use and publicly accessible via the links provided to the Federal LCA Commons' USLCI Database. These specific processes have been added to USLCI from GREET 2023.
Water	freighter	Transport, container ship; distillate powered; average location mix/tkm/US [i]	2005-2013/US	
		Transport, container ship; residual fuel oil powered; average location mix [j]		
		Transport, container ship; average fuel mix/tkm/US [k]	2023/US	
		Transport, ocean freighter, average fuel mix/tkm/US	2007/US	
	barge	Transport, barge, average fuel mix	2007/US	
		Transport, barge, diesel powered	2003/US	
Air	scheduled air transportation (freight)	Transport, aircraft, freight	2010-2021/US	

[a] <lcacommons.gov/lca-collaboration/a685da05-1a42-3fe1-a68b-6db458be5e07>
[b] <lcacommons.gov/lca-collaboration/8d1daa68-bede-347a-86a4-aeca5383906c>
[c] <lcacommons.gov/lca-collaboration/60785dad-585a-3fe9-ae8e-507f0cbc7f6f>
[d] <lcacommons.gov/lca-collaboration/c3ba0cd2-d36d-396a-8295-bd4c00979cf6>
[e] <lcacommons.gov/lca-collaboration/707525a6-c6e4-31e0-a728-5685f0133b9c>
[f] <lcacommons.gov/lca-collaboration/711ab26a-94a2-33f9-89da-560c55808297>
[g] <lcacommons.gov/lca-collaboration/ba328bfe-68dd-3d33-a95e-bdcd28252c39>
[h] <lcacommons.gov/lca-collaboration/7de9c230-fd0f-3478-be87-f80181132faa>
[i] <lcacommons.gov/lca-collaboration/da0f5501-f4ab-32d1-80b7-b70d143608f6>
[j] <lcacommons.gov/lca-collaboration/f85fcdde-6c6b-3bbb-8efc-de6cb34c9ac7>
[k] <lcacommons.gov/lca-collaboration/1e2429d8-8d91-328f-85c3-18d39bdebfa7>
[l] <github.com/FLCAC-admin/uslci-content/blob/dev/docs/release_info/press-release.md>

Table 9
Energy data

Energy source	Default LCI data	Data collection year/Region	Notes
Electricity generation	US electricity baseline from the USLCI [a] Canada and Mexico electricity baseline from ecoinvent v3.10 [b]	2022/US 2022/Canada and Mexico	For the US: Electrical dataset instructions US electrical grid will use NETL data, and an unweighted average of all of the balancing authorities represented in the zip code the aggregate is produced in. See examples below: • US electricity calculation protocol: ○ Electricity data in the DOE NETL is regionalized at the country (US average), FERC region, and balancing authority (BA) levels. BA-level electricity data shall be used according to the specifications in Annex 1 and the following algorithm: ▪ Identify a facility's available balancing authorities using the facility zip code and the US Energy Atlas zip code-to-BA mapping. If multiple BAs are mapped to a zip code, electricity impacts shall be estimated using the unweighted arithmetic mean of each TRACI 2.1 indicator for the set of BAs mapped to the given zip code. For example, if three balancing authorities (BA1, BA2, and BA3) are mapped to a single zip code (C), then the GHG impacts for 1 MW of electricity for zip code C will be calculated as: GHG(C) = (GHG BA1 + GHG BA2 + GHG BA3)/3 • Canadian electricity calculation protocol: ○ Canadian electrical grid will use province-level ecoinvent 3.8 data from the province the aggregate is produced in. Summary of Changes None.

Table 9
Energy data

Energy source	Default LCI data	Data collection year/Region	Notes
Site energy	Natural gas; combusted in industrial boiler/US [c]	Data created: 2015 Data updated: 2024 Region: US	USLCI Database (NREL) [g] All data is free-to-use and publicly accessible via the links provided to the Federal LCA Commons' USLCI Database. Note that not all flows included metadata for the data collection period. In lieu of the data collection period, information on the data's creation date and last update have been provided.
	Residual fuel oil; combusted in industrial boiler/US [d]	Data created: 2013 Data updated: 2024 Region: North America	
	Diesel; combusted in industrial equipment/US [e]	Data created: 2015 Data updated: 2023	
	Gasoline; combusted in equipment/US [f]	Data created: 2015 Data updated: 2023 Region: North America	

[a] < lcacommons.gov/lca-collaboration/Federal_LCA_Commons/US_electricity_baseline/datasets>
[b] <ecoinvent.org/ecoinvent-v3-10>
[c] <lcacommons.gov/lca-collaboration/f347daea-82be-4e62-8872-a0dc0ca24ca3>
[d] <lcacommons.gov/lca-collaboration/9d9b6815-9349-30af-869b-57362428c42e>
[e] <lcacommons.gov/lca-collaboration/d6ad7035-5498-3237-8abd-50e93b1eef89>
[f] <lcacommons.gov/lca-collaboration/d3e13675-1455-375f-a557-bb8234de75ff>
[g] <lcacommons.gov/lca-collaboration/National_Renewable_Energy_Laboratory/USLCI_Database_Public/datasets/Processes

Table 10
Additional characterization factors for abiotic depletion potential (ADP) (per EN 16757:2017 [14])

Substance	Unit	Group	Initial emission or extraction	Characterization factor kg antimony eq.	Comment
clay	kg	element	resources	1.4E-11	Product related 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 (SiO_2)	kg	element	resources	1.4E-11	assimilated to silicon
sand (unspecified)	kg	element	resources	1.4E-11	assimilated to silicon

Annex B

Default distances for A2 ocean transportation

As noted in Section 7.1.7.2, primary data shall be used to determine ocean transport distances for Module A2/A4 where available. In the absence of representative primary data, the default distances provided in this Annex may be used. These tables define assumed transport distances based on export country and import location and are intended to provide a consistent and conservative basis for modeling international shipping. When applying default values, users shall select the most appropriate origin–destination pair and document the selection, including any assumptions or deviations, within the EPD.

Pacific – Nautical miles (nm)

	US							Canada
	Anchorage, AK	Columbia-Snake River, OR/WA	Honolulu, HI	Los Angeles, CA	San Diego, CA	San Francisco, CA	Seattle, WA	Vancouver, BC
China	4,482	5,365	4,718	6,018	6,103	5,707	5,401	5,417
Egypt	11,090	10,144	10,753	11,356	9,215	9,617	11,316	10,392
Korea	3,693	4,610	4,058	5,235	5,317	4,924	4,613	4,629
Mexico	3,042	1,707	2,767	832	756	1,174	1,936	1,952
Taiwan	4,446	5,328	4,430	5,986	6,057	5,680	5,367	5,383
Thailand	6,224	7,073	6,123	7,696	7,782	7,389	7,101	7,117
Turkey	11,277	9,923	10,838	9,062	8,994	9,396	10,155	10,171
Vietnam	5,477	6,357	5,399	6,998	7,079	6,693	6,383	6,399

Pacific – Miles (mi)

	US							Canada
	Anchorage, AK	Columbia-Snake River, OR/WA	Honolulu, HI	Los Angeles, CA	San Diego, CA	San Francisco, CA	Seattle, WA	Vancouver, BC
China	5,158	6,174	5,429	6,925	7,023	6,568	6,216	6,234
Egypt	12,762	11,674	12,375	13,068	10,604	11,067	13,022	11,959
Korea	4,250	5,305	4,670	6,024	6,119	5,666	5,308	5,327
Mexico	3,500	1,964	3,185	957	870	1,351	2,228	2,246
Taiwan	5,117	6,131	5,098	6,888	6,970	6,536	6,177	6,195
Thailand	7,163	8,139	7,046	8,856	8,955	8,503	8,172	8,190
Turkey	12,977	11,419	12,472	10,428	10,350	10,812	11,686	11,704
Vietnam	6,303	7,316	6,213	8,053	8,147	7,702	7,345	7,363

North Atlantic – Nautical miles (nm)

	US									Canada	
	Baltimore, MD	Boston, MA	Charleston, SC	New York, NY	Norfolk, VA	Philadelphia, PA	Providence, RI	Savannah, GA	Wilmington, NC	Halifax, NS	St. John's, NL
Algeria	3,942	3,500	4,066	3,663	3,819	3,804	3,575	4,141	4,005	3,171	3,390
Brazil	3,790	3,723	3,649	3,739	3,667	3,780	3,709	3,676	3,644	3,641	3,757
Colombia	1,958	2,192	1,615	2,027	1,835	2,002	2,101	1,616	1,664	2,351	2,350
Croatia	4,980	4,538	5,104	4,701	4,857	4,842	4,857	5,179	5,043	4,209	4,428
Cyprus	5,358	4,916	5,482	5,079	5,235	5,220	4,991	5,557	5,391	4,587	4,806
Egypt	5,492	5,050	5,616	5,213	5,369	5,354	5,125	5,691	5,555	4,721	4,940
France	3,459	3,005	3,610	3,173	3,337	3,318	3,077	3,713	3,546	2,586	2,841
Greece	4,848	4,406	4,972	4,569	4,725	4,710	4,481	5,047	4,911	4,077	4,296
Mexico	1,876	2,192	1,425	1,955	1,753	1,922	2,053	1,396	1,514	2,395	2,351
Saudi Arabia	6,898	6,456	7,022	6,619	6,775	6,760	6,531	7,097	6,961	6,127	6,346
Spain	3,613	3,170	3,754	3,334	3,490	3,474	3,244	3,829	2,654	2,819	3,049
Tunisia	4,413	3,971	4,537	4,134	4,290	4,275	4,046	4,612	4,476	3,642	3,861
Turkey	5,271	4,829	5,395	4,992	5,148	5,133	4,904	5,470	5,334	4,500	4,719
UAE	8,341	7,899	8,465	8,062	8,218	8,203	7,974	8,540	8,404	7,570	7,789
UK	3,438	2,983	3,582	3,151	3,315	3,296	3,055	3,708	3,518	2,546	2,787
Vietnam	11,412	10,970	11,288	11,133	11,289	11,274	11,045	11,315	11,301	10,641	10,860

North Atlantic – Miles (mi)

	US									Canada	
	Baltimore, MD	Boston, MA	Charleston, SC	New York, NY	Norfolk, VA	Philadelphia, PA	Providence, RI	Savannah, GA	Wilmington, NC	Halifax, NS	St. John's, NL
Algeria	4,537	4,028	4,679	4,216	4,395	4,378	4,114	4,766	4,609	3,650	3,902
Brazil	4,361	4,285	4,199	4,303	4,220	4,350	4,268	4,230	4,193	4,190	4,323
Colombia	2,253	2,522	1,859	2,332	2,112	2,304	2,417	1,860	1,915	2,706	2,704
Croatia	5,731	5,223	5,874	5,410	5,590	5,572	5,590	5,960	5,804	4,844	5,096
Cyprus	6,166	5,658	6,309	5,845	6,025	6,007	5,744	6,395	6,204	5,279	5,531
Egypt	6,320	5,811	6,463	5,999	6,179	6,161	5,898	6,549	6,393	5,433	5,685
France	3,981	3,458	4,154	3,651	3,840	3,818	3,541	4,273	4,081	2,976	3,269
Greece	5,579	5,070	5,722	5,258	5,437	5,420	5,157	5,808	5,651	4,692	4,944
Mexico	2,159	2,523	1,640	2,250	2,017	2,212	2,363	1,606	1,742	2,756	2,705
Saudi Arabia	7,938	7,429	8,081	7,617	7,797	7,779	7,516	8,167	8,011	7,051	7,303
Spain	4,158	3,648	4,320	3,837	4,017	3,998	3,733	4,406	3,055	3,244	3,509
Tunisia	5,078	4,569	5,221	4,757	4,936	4,919	4,656	5,307	5,151	4,191	4,443
Turkey	6,065	5,557	6,208	5,744	5,924	5,907	5,643	6,294	6,138	5,178	5,430
UAE	9,599	9,090	9,742	9,278	9,457	9,440	9,177	9,828	9,672	8,712	8,964
UK	3,957	3,433	4,122	3,626	3,815	3,793	3,516	4,267	4,049	2,930	3,208
Vietnam	13,132	12,624	12,990	12,811	12,991	12,974	12,710	13,021	13,005	12,245	12,497

North Atlantic – Kilometers (km)

	US									Canada	
	Baltimore, MD	Boston, MA	Charleston, SC	New York, NY	Norfolk, VA	Philadelphia, PA	Providence, RI	Savannah, GA	Wilmington, NC	Halifax, NS	St. John's, NL
Algeria	7,301	6,483	7,531	6,784	7,073	7,046	6,622	7,670	7,418	5,873	6,279
Brazil	7,019	6,896	6,757	6,925	6,791	7,001	6,868	6,808	6,749	6,743	6,957
Colombia	3,626	4,059	2,992	3,753	3,398	3,708	3,890	2,993	3,082	4,355	4,352
Croatia	9,224	8,405	9,453	8,707	8,996	8,968	8,996	9,592	9,340	7,796	8,201
Cyprus	9,924	9,105	10,153	9,407	9,696	9,668	9,244	10,292	9,985	8,496	8,901
Egypt	10,171	9,353	10,401	9,654	9,943	9,916	9,491	10,540	10,288	8,743	9,149
France	6,407	5,565	6,685	5,876	6,179	6,144	5,699	6,877	6,568	4,789	5,261
Greece	8,978	8,160	9,208	8,462	8,751	8,723	8,299	9,347	9,095	7,551	7,956
Mexico	3,474	4,060	2,639	3,621	3,247	3,560	3,802	2,585	2,804	4,436	4,354
Saudi Arabia	12,775	11,956	13,005	12,258	12,547	12,519	12,095	13,144	12,892	11,347	11,753
Spain	6,692	5,870	6,952	6,175	6,464	6,434	6,008	7,091	4,916	5,220	5,647
Tunisia	8,172	7,354	8,402	7,656	7,944	7,917	7,493	8,541	8,289	6,744	7,150
Turkey	9,761	8,943	9,991	9,245	9,533	9,506	9,082	10,130	9,878	8,333	8,739
UAE	15,448	14,630	15,678	14,931	15,220	15,193	14,768	15,817	15,565	14,020	14,426
UK	6,368	5,525	6,634	5,836	6,140	6,105	5,658	6,867	6,516	4,715	5,162
Vietnam	21,134	20,316	20,906	20,618	20,907	20,879	20,455	20,956	20,929	19,706	20,112

Gulf of Mexico and Caribbean – Nautical miles (nm)

	US						
	Houston, TX	**Miami, FL**	**Mobile, AL**	**New Orleans, LA**	**San Juan, PR**	**Tampa, FL**	**US Virgin Islands**
Algeria	5,225	4,293	4,954	5,027	3,811	4,697	3,764
Colombia	1,752	1,287	1,592	1,617	970	1,426	999
Croatia	6,263	5,331	5,992	6,065	4,849	5,735	4,802
Denmark	5,248	4,305	4,978	5,050	4,156	4,721	4,152
Egypt	6,775	5,843	6,504	6,577	5,361	6,247	5,314
Greece	6,131	5,199	5,860	5,933	4,717	5,603	4,670
India	10,209	9,277	9,938	10,011	8,795	9,681	8,748
Italy	5,640	4,708	5,369	5,442	4,226	5,112	4,179
Mexico	635	1,008	803	788	1,758	916	1,826
Saudi Arabia	8,181	7,249	7,910	7,983	6,767	7,653	6,720
Spain	4,922	3,987	4,652	4,724	3,557	4,497	3,513
Sweden	5,250	4,307	4,980	5,052	4,158	4,723	4,155
Tunisia	5,696	4,764	5,425	5,498	4,282	5,168	4,235
Turkey	6,554	5,622	6,283	6,356	5,140	6,026	5,093
UAE	9,624	8,692	9,353	9,426	8,210	9,096	8,163
Vietnam	11,336	11,008	11,171	11,211	10,800	11,020	10,833

Gulf of Mexico and Caribbean – Miles (mi)

	US						
	Houston, TX	Miami, FL	Mobile, AL	New Orleans, LA	San Juan, PR	Tampa, FL	US Virgin Islands
Algeria	6,013	4,941	5,701	5,785	4,386	5,406	4,332
Colombia	2,016	1,481	1,832	1,861	1,116	1,641	1,149
Croatia	7,208	6,135	6,896	6,980	5,581	6,600	5,526
Denmark	6,039	4,954	5,729	5,811	4,783	5,433	4,778
Egypt	7,797	6,724	7,485	7,569	6,169	7,189	6,115
Greece	7,055	5,983	6,744	6,828	5,428	6,448	5,374
India	11,748	10,676	11,436	11,520	10,121	11,141	10,067
Italy	6,491	5,418	6,179	6,263	4,864	5,883	4,809
Mexico	731	1,160	924	907	2,023	1,054	2,101
Saudi Arabia	9,415	8,342	9,103	9,187	7,787	8,807	7,733
Spain	5,664	4,588	5,353	5,436	4,093	5,175	4,043
Sweden	6,042	4,956	5,731	5,814	4,785	5,435	4,781
Tunisia	6,554	5,482	6,243	6,327	4,927	5,947	4,874
Turkey	7,542	6,469	7,230	7,314	5,915	6,934	5,861
UAE	11,075	10,003	10,764	10,848	9,448	10,468	9,394
Vietnam	13,045	12,668	12,855	12,901	12,428	12,682	12,466

Gulf of Mexico and Caribbean – Kilometers (km)

	US						
	Houston, TX	Miami, FL	Mobile, AL	New Orleans, LA	San Juan, PR	Tampa, FL	US Virgin Islands
Algeria	9,677	7,951	9,175	9,311	7,059	8,699	6,971
Colombia	3,245	2,383	2,948	2,995	1,796	2,642	1,850
Croatia	11,600	9,874	11,098	11,233	8,981	10,622	8,893
Denmark	9,719	7,973	9,219	9,353	7,697	8,743	7,689
Egypt	12,547	10,821	12,045	12,181	9,929	11,569	9,842
Greece	11,355	9,629	10,853	10,988	8,736	10,377	8,649
India	18,907	17,181	18,405	18,540	16,288	17,929	16,201
Italy	10,446	8,720	9,944	10,079	7,827	9,468	7,739
Mexico	1,176	1,867	1,487	1,459	3,256	1,696	3,382
Saudi Arabia	15,151	13,425	14,649	14,784	12,532	14,173	12,445
Spain	9,116	7,383	8,615	8,749	6,587	8,328	6,507
Sweden	9,723	7,977	9,223	9,356	7,701	8,747	7,695
Tunisia	10,548	8,822	10,046	10,182	7,930	9,570	7,843
Turkey	12,137	10,411	11,635	11,771	9,519	11,160	9,432
UAE	17,824	16,098	17,322	17,458	15,206	16,846	15,118
Vietnam	20,994	20,387	20,689	20,763	20,002	20,409	20,063

Great Lakes and St. Lawrence River – Nautical miles (nm)

	US					Canada			
	Buffalo, NY	Chicago, IL	Cleveland, OH	Detroit, MI	Milwaukee, WI	Montreal, QC	Quebec City, QC	Toronto, ON	Trois-Rivieres, QC
Algeria	3,972	4,714	4,092	4,165	4,658	3,637	3,498	3,928	3,566
China	12,029	12,771	12,149	12,222	12,715	11,694	11,555	11,985	11,623
France	3,429	4,171	3,549	3,622	4,115	3,094	2,955	3,384	3,023
Germany	3,782	4,524	3,902	3,975	4,458	3,437	3,298	3,728	3,366
Greece	4,878	5,620	4,998	5,071	5,564	4,543	4,404	4,834	4,472
Ireland	3,153	3,895	3,273	3,346	3,839	2,818	2,679	3,109	2,747
Korea	11,653	12,395	11,773	11,846	12,339	11,318	11,179	11,609	11,247
Morocco	3,547	4,289	3,667	3,740	4,181	3,242	3,103	3,503	3,141
Netherlands	3,621	4,386	3,759	3,832	4,307	3,286	3,147	3,577	3,215
Poland	4,020	4,762	4,140	4,213	4,717	3,696	3,557	3,987	3,625
South Africa	7,737	8,479	7,857	7,930	8,423	7,402	7,263	7,693	7,331
Turkey	5,301	6,043	5,421	5,494	5,987	4,966	4,827	5,257	4,895
Vietnam	11,442	12,184	11,562	11,635	12,128	11,107	10,968	11,398	11,036

Great Lakes and St. Lawrence River – Miles (mi)

	US					Canada			
	Buffalo, NY	Chicago, IL	Cleveland, OH	Detroit, MI	Milwaukee, WI	Montreal, QC	Quebec City, QC	Toronto, ON	Trois-Rivieres, QC
Algeria	4,571	5,425	4,709	4,793	5,361	4,186	4,026	4,521	4,104
China	13,843	14,697	13,981	14,065	14,632	13,457	13,297	13,792	13,376
France	3,946	4,800	4,084	4,168	4,735	3,560	3,400	3,895	3,478
Germany	4,353	5,207	4,491	4,575	5,130	3,955	3,795	4,290	3,874
Greece	5,614	6,467	5,752	5,836	6,403	5,228	5,068	5,563	5,146
Ireland	3,628	4,482	3,767	3,851	4,418	3,243	3,083	3,578	3,161
Korea	13,410	14,264	13,549	13,633	14,200	13,025	12,865	13,360	12,943
Morocco	4,082	4,936	4,220	4,304	4,811	3,731	3,571	4,032	3,615
Netherlands	4,167	5,047	4,325	4,409	4,956	3,781	3,621	4,116	3,699
Poland	4,626	5,480	4,764	4,848	5,428	4,253	4,093	4,588	4,172
South Africa	8,904	9,758	9,042	9,126	9,693	8,518	8,358	8,853	8,437
Turkey	6,100	6,954	6,238	6,322	6,889	5,714	5,554	6,049	5,633
Vietnam	13,167	14,021	13,305	13,389	13,956	12,781	12,621	13,116	12,700

Great Lakes and St. Lawrence River – Kilometers (km)

	US					Canada			
	Buffalo, NY	Chicago, IL	Cleveland, OH	Detroit, MI	Milwaukee, WI	Montreal, QC	Quebec City, QC	Toronto, ON	Trois-Rivieres, QC
Algeria	7,357	8,731	7,579	7,714	8,627	6,736	6,479	7,275	6,605
China	22,278	23,652	22,500	22,635	23,548	21,657	21,400	22,196	21,526
France	6,350	7,724	6,572	6,707	7,620	5,729	5,472	6,268	5,598
Germany	7,005	8,379	7,227	7,362	8,256	6,365	6,108	6,904	6,234
Greece	9,034	10,408	9,256	9,391	10,305	8,414	8,156	8,953	8,282
Ireland	5,839	7,214	6,062	6,197	7,110	5,219	4,961	5,758	5,087
Korea	21,582	22,956	21,804	21,939	22,852	20,962	20,704	21,500	20,830
Morocco	6,570	7,944	6,792	6,927	7,743	6,005	5,747	6,488	5,818
Netherlands	6,705	8,122	6,961	7,096	7,976	6,085	5,828	6,624	5,954
Poland	7,445	8,819	7,667	7,802	8,736	6,845	6,588	7,384	6,713
South Africa	14,330	15,704	14,552	14,687	15,600	13,709	13,452	14,248	13,578
Turkey	9,817	11,191	10,039	10,174	11,087	9,196	8,939	9,735	9,065
Vietnam	21,190	22,564	21,412	21,547	22,460	20,570	20,312	21,108	20,438

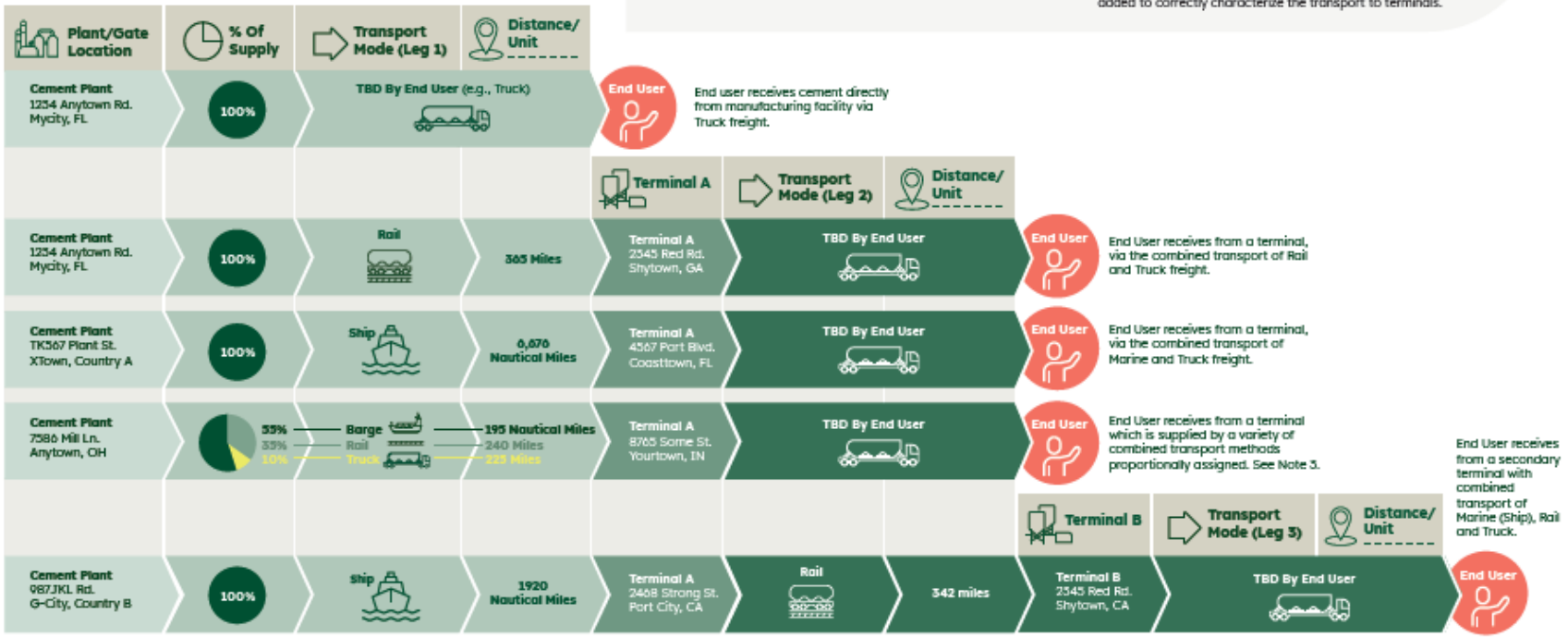
Annex C

Reference method

Table C-1 — Method for reporting transportation mode and distances from cement plant gate to cement terminal(s)

Notes:

1. **Terminal:** Any intermediate transloading or storage facility between the cement manufacturing and the end user's site.
2. **Transport:** There are a variety of transport modes. The most common are listed here. It is common practice for more than one transport mode to be used to move cement from the manufacturer's gate to the end user.
3. **Multiple modes:** Many terminals receive cement from a single manufacturer's gate via more than one mode. When this is the case, the manufacturer shall provide the proportional share of each transport mode based on the past year's shipments.
4. **Example scenarios:** The examples given below do not cover all situations. Additional terminals and transport legs shall be added to correctly characterize the transport to terminals.



Published in SmartEPD Part B PCR for Cements for Construction 1000-010,v4.0. <smartepd.com/pcr-library>

Annex Z
Deviation

ATTACHMENT B

DEVIATION REQUEST

SECTION 1	To be completed by originating department	DEVIATION ID (assigned by Quality)	2025-003

Date of request: 1/27/2025

Originator (signature): Andrea O. Burr

Type of Deviation Request:

☐ New request

☒ Extension request. Original Deviation ID; 2022-013, 2023-021 (extension), 2024-008(extension)

Deviation from[1] [Document(s) & Section(s)]:
PCR for Concrete v2.3

Description of deviation[2] (attach supporting documentation, if applicable): Detail specifically what is proposed and what exists currently. If this is an extension, include reason extension is required.

See attached.

Rationale for deviation[3]:
Working with the Colorado DOT, the proposed language has been developed as a first step (data gathering followed by analysis) to make a determination whether environmental impacts associated with concrete batch plants creating more than a 1% variance. This data will be used to determine whether the proposed language should be added to the PCR.

The PCR has been extended through 2/28/2025 and is currently under revision. The committee has determined to include this information in the body of the document going forward. It is anticipated that the PCR will be published by 2/28/2025.

The PCR is being extended through 2/28/2026 and is currently under revision. It is anticipated that the PCR will publish by 7/1/2025

Original Documentation Change Status[4]:

☒ Issue paper/change documentation submitted. Date of submission: 6/28/2022

☒ In draft. Date of planned submission: 3/15/2025

☒ Other. Comments: Data collection by industry members through 12/31/2023

Proposed Start Date[5]:
1/27/2025

Proposed End Date[6] (no greater than one year *new* or 6 months for initial *extensions, refer to Quality for any other date*): 7/31/2025

Detail of how affected clients will be notified of this deviation[7]:
The deviation will be included in an Annex at the back of the PCR.

Impact to current listings[8]:
None

Impact to rejected listings[9]:
None

Impact to in-process listings[10]:
None

Effect of proposed change on other parameters[11]: **None**			
Should deviation be retired repealed, rejected, etc. post approval what actions will department take to affected listings[12]: **None necessary, this is data gathering only.**			
Statement (if any) to be included in Listing[13]: **None**			
Division Approval Signature: X JE approved via email on 28-Jan-2025; see attached		Date:	
SECTION 2	To be completed by originating department Quality Group	DEVIATION ID (assigned by Quality)	2025-003
Section 1 complete: ☒ VC 29-Jan-2025		Section 1 approved by appropriate staff: ☒ VC 29-Jan-2025	
Deviation ID created: ☒ VC 29-Jan-2025		Remaining approvals identified: ☒ VC 29-Jan-2025	
Division Quality approval (signature): VinnaFayeClavo		Date: 29-Jan-2025	
SECTION 3	Approvals: Selection to be made by originating department Quality Group	DEVIATION ID (assigned by Quality)	2025-003
☐ Standards/Policies	Signature:	Date:	Title:
☒ Program Division J. Brown	Signature: Approved 29-Jan-2025; see attached email	Date:	Title: Senior Manager Food Advisory & Training - Environmental Products
☐ Toxicology	Signature:	Date:	Title:
☐ Laboratory	Signature:	Date:	Title:
☐ Audit Delivery	Signature:	Date:	Title:
☒ Quality Management ☐Lab ☒Program T. Hughes	Signature: Approved 30-Jan-2025; see attached email	Date:	Title: Senior Manager QA Americas
☐ Finance	Signature:	Date:	Title:
☐ Informatics	Signature:	Date:	Title:
☐ Legal/Compliance and Risk	Signature:	Date:	Title:
☒ Senior Management M. Allen	Signature: Approved 29-Jan-2025; see attached email	Date:	Title: Senior Director, Advisory & Training
☐ Other	Signature:	Date:	Title:
☐ Other	Signature:	Date:	Title:
☐ Other	Signature:	Date:	Title:
☐ Other	Signature:	Date:	Title:

All proposed changes are reflected in the language below showing in red.

For section 7.1.7.2 A1 to A3, production stage (possibly between G and H or after H):

Portable equipment to produce concrete mixes at a project-site, such as, but not limited to portable wet batch plants, portable dry batch plants, and mobile volumetric mixing equipment, shall be modeled using the following rules for data collection:

- *The transportation distance and mode for raw materials to the location indicated in the EPD for the declared concrete mix.*
- ~~*Regionalized data for energy and raw materials for the location indicated in the EPD.*~~
- *Mobilization of the plant to the location indicated in the EPD reported under module [A3]. This can be left out if the transportation for mobilization is less than 1% of the total transportation that includes the mobilization of the plant and the mix design raw materials for the intended project.*
- *Average operations based on an inventory of energy, consumables, emissions and waste and the produced volume, for a 12-month period not older than 2 years prior to issuing the EPD. Average operations for new portable plants or plants that have not been used enough to cover the 12-month period may be estimated based on operational data for similar equipment used in similar applications.*

For section 11. VERIFICATION AND VALIDITY OF AN EPD (after E):

EPDs for portable concrete batch plants are only considered valid for the location and the period that the mix is produced at the location indicated in the EPD.

Improving Human and Planet Health

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