

PRODUCT CATEGORY RULES FOR PREPARING  
AN ENVIRONMENTAL PRODUCT DECLARATION  
FOR CONSTRUCTION AGGREGATES: NATURAL  
AGGREGATE, CRUSHED CONCRETE, AND IRON/STEEL  
FURNACE SLAG



PCR

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## Construction Aggregates: Natural Aggregate, Crushed Concrete, and Iron/Steel Furnace Slag **UNCPC 1532**

Construction Aggregate, which can be defined as any combination of sand, gravel, crushed stone, crushed concrete, iron and / or steel slag, sold to or used by the construction industry.





# Construction Aggregates: Natural Aggregate, Crushed Concrete, and Iron/Steel Furnace Slag

## Scope of Validity of these PCR

This product group includes construction aggregates used for bound applications such as hydraulic cement concrete and asphalt paving mixtures and unbound applications such as highway base courses and erosion control stones.

## Program Operator

ASTM International

## Interested Parties

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

- Lehigh Hanson, Inc.
- Edw. C. Levy Co.
- TACA
- Chryso Inc.
- Oregon State University
- LaFarge
- Vulcan Materials
- Martin Marietta
- McCarthy Improvement Company

## Review Panel

- Jamie Meil, Athena Institute (Chairperson)
  - Emily Coyner, National Stone, Sand and Gravel Association
  - Rebecca McDaniel, Purdue University
- The PCR peer review report is available upon request at: [cert@astm.org](mailto:cert@astm.org)

## PCR VERSION HISTORY

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## 1.0 General Information

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

### 1.1 | GOAL AND SCOPE

This PCR document specifies rules, requirements, and guidelines for developing EPDs for aggregates and underlying requirements of related life-cycle assessments (LCAs). These PCR are valid for, and provide requirements for, Cradle-to-Gate EPDs.

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

- raw materials acquisition;
- transportation;
- manufacturing; and
- packaging if relevant.

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

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

While not necessarily complying with the CEN EN 15804 standard, it is referenced in Section 12 and has been consulted with regard to selected requirements and presentation details that go beyond or expand on the above-noted ISO standards.

### 1.2 | EPD OWNERSHIP/RESPONSIBILITY

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

## 2.0 Period of Validity

This PCR document is effective for five (5) years from the latest date of publication. If after five years, relevant changes in the product category or other relevant factors have occurred (for example, changes in LCA methodology), the document will be revised. Revisions may also be made to these PCR during the period of validity, however such changes do not have to be reflected in existing EPDs during their validity period unless the EPD owners choose to do so.

An EPD created under these PCR shall be valid for a five (5) year period from the date of issue after which it shall be reviewed and verified. An EPD shall be reassessed and updated after five years as necessary to reflect changes in technology or other circumstances that could alter the content and accuracy of the declaration. The process for verification and establishing the validity of an EPD shall be in accordance with ISO 14025 and ISO 21930.

### 3.0 Definitions

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

**aggregate, n** | granular material of mineral composition such as sand, gravel, shell, slag or crushed stone used with a cementing medium to form mortars or concrete. Or alone as in base courses, railroad ballasts, etc. (ASTM D8)

**blast-furnace slag, n** | the nonmetallic product consisting essentially of silicates and aluminosilicates of lime and other bases, that is developed simultaneously with iron in a blast furnace. (ASTM D8)

**coarse aggregate, n** | (1) aggregate predominantly retained on the 4.75-mm (No. 4) sieve; or (2) that portion of an aggregate retained on the 4.75-mm (No. 4) sieve. (ASTM C125)

Discussion—The definitions are alternatives to be applied under differing circumstances. Definition (1) is applied to an entire aggregate either in a natural condition or after processing. Definition (2) is applied to a portion of an aggregate. Requirements for properties and grading should be stated in the specification.

**fine aggregate, n** | (1) aggregate passing the 9.5-mm (3/8-in.) sieve and almost entirely passing the 4.75-mm (No. 4) sieve and predominantly retained on the 75- $\mu$ m (No. 200) sieve; or (2) that portion of an aggregate passing the 4.75-mm (No. 4) sieve and retained on the 75- $\mu$ m (No. 200) sieve. (ASTM C125)

Discussion—The definitions are alternatives to be applied under differing circumstances. Definition (1) is applied to an entire aggregate either in a natural condition or after processing. Definition (2) is applied to a portion of an aggregate. Requirements for properties and grading should be stated in the specifications.

**heavyweight aggregate, n** | see high-density aggregate.

**high-density aggregate, n** | aggregate with relative density greater than 3.3, such as: barite, magnetite, limonite, ilmenite, iron, or steel. (ASTM C125)

**lightweight aggregate, n** | see low-density aggregate.

**low-density aggregate, n** | aggregate with bulk density less than 1120 kg/m<sup>3</sup> [70 lb/ft<sup>3</sup>], such as: pumice, scoria, volcanic cinders, tuff, and diatomite; expanded or sintered clay, shale, slate, diatomaceous shale, perlite, vermiculite, or slag; and end products of coal or coke combustion. (ASTM C125)

**normal-density aggregate, n** | aggregate that is neither high nor low density. (ASTM C125)

Discussion—This term refers to aggregate with relative density typically ranging between 2.4 and 3.0, or with bulk density typically ranging between 1120 kg/m<sup>3</sup> [70 lb/ft<sup>3</sup>] and 1920 kg/m<sup>3</sup> [120 lb/ft<sup>3</sup>].

**normal-weight aggregate, n** | see normal-density aggregate.

**steel slag, n** | the nonmetallic product consisting of essentially calcium silicates and ferrites combined with fused oxides of iron, aluminum, manganese, calcium and magnesium, that is developed simultaneously with steel in basic oxygen, electric or open hearth furnaces. (ASTM D8)

Note: These PCR do not cover expanded shale, clay and slate lightweight aggregates (see ASTM International Product Category Rules for Preparing an Environmental Product Declaration for Expanded Shale, Clay and Slate Lightweight Aggregates).

## 4.0 Informed Comparison

EPDs may enable comparison between products but do not themselves compare products, as stated in ISO 14025, Sections 4 and 6.7.2. It shall be stated in EPDs created using these PCR that only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, reference service life, and quantified by the same functional unit, and meeting all the conditions in ISO 14025, Section 6.7.2 can be used to assist purchasers and users in making informed comparisons between products. EPDs based on cradle-to-gate information modules shall not be used for comparisons unless using a functional unit and complying with all of the requirements set out in ISO 14025, Section 6.7.2, and ISO 21930, Section 5.6 when the product is used in buildings. EPDs based on a declared unit shall not be used for comparisons.

Because an EPD prepared using these PCR only covers cradle-to-gate phases of the life cycle, the following shall be stated in the EPD: This EPD covers only the cradle-to-gate impacts of aggregates using a declared unit and the results cannot be used to compare between products.

## 5.0 Company/Organization, Product, and Product Category

### 5.1 | DESCRIPTION OF COMPANY/ORGANIZATION

The name of the company/organization as well as the place(s) of production shall be provided in the EPD. The EPD may also include general information about the company/organization such as the existence of quality systems, an environmental management system according to ISO 14001, or any other environmental management systems in place (see Section 9.0).



**5.2 | PRODUCT-RELATED STANDARDS**

These PCR address the aggregates listed in Table 1, which also shows the standards that provide detailed descriptions and specifications for each product.

**TABLE 1:** Aggregates and Related Standards

Type of Aggregate	Description/Specification
Aggregates for Concrete	ASTM C33/C33M-13 Standard Specification for Concrete Aggregates C144-11 Standard Specification for Aggregate for Masonry Mortar ASTM C330/C330M-14 Standard Specification for Lightweight Aggregates for Structural Concrete ASTM C331/C331M-14 Standard Specification for Lightweight Aggregates for Concrete Masonry Units ASTM C332-09 Standard Specification for Lightweight Aggregates for Insulating Concrete ASTM C637-14 Standard Specification for Aggregates for Radiation-Shielding Concrete C1797-16e1 Standard Specification for Ground Calcium Carbonate and Aggregate Mineral Fillers for Use in Hydraulic Cement Concrete
Aggregate for Asphalt Mixtures	ASTM D6155-13 Standard Specification for Nontraditional Coarse Aggregates for Bituminous Paving Mixtures D692/D692M-15 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures D1073-11 Standard Specification for Fine Aggregate for Bituminous Paving Mixtures D1139/D1139M-15 Standard Specification for Aggregate for Single or Multiple Bituminous Surface Treatments D5106-15 Standard Specification for Steel Slag Aggregates for Bituminous Paving Mixtures
Unbound Aggregates	D2940/D2940M-15 Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports D4992-14e1 Standard Practice for Evaluation of Rock to be Used for Erosion Control D6092-14 Standard Practice for Specifying Standard Sizes of Stone for Erosion Control D6711-15 Standard Practice for Specifying Rock to Fill Gabions, Revet Mattresses and Gabion Mattresses

### 5.3 | DESCRIPTION OF PRODUCT

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

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

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

## 6.0 Requirements for the Underlying LCA

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

### 6.1 | FUNCTIONAL AND DECLARED UNIT

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

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

Since these PCR for aggregates only cover the cradle-to-gate stages, the declared unit shall be used. The declared unit shall be 1 metric tonne (dry weight basis) of aggregate that is ready for shipment. Data may additionally be provided per ton of aggregate.

## 6.2 | SYSTEM BOUNDARIES

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

**FIGURE 1:** Life-Cycle Stages and Modules

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

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

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

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

In the case of EPDs based on these PCR, modules A1 to A3 (highlighted in Figure 1) apply. The following factors are to be taken into account for each life cycle stage.

### Modules A1-A3, the Product Stage:

A1 – This module includes the following:

Extraction and processing of raw materials, including fuels used in extraction and transport within the process:

- Reuse of products or materials from a previous product system;
- Processing of secondary materials used as input for manufacturing the product, but not including those processes that are part of the waste processing in the previous product system;
- Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport; and
- Energy recovery and other recovery processes from secondary fuels, but not including those processes that are part of waste processing in the previous product system.

A2 - Average or specific transportation of raw materials (including recycled materials) from extraction site or source to manufacturing site (including any recovered materials from source to be recycled in the process) and including empty backhauls and transportation to interim distribution centers or terminals. Cite data sources for empty backhauls (e.g., U.S. Life Cycle Inventory Database, [www.nrel.gov/lci](http://www.nrel.gov/lci)) or describe method used to account for empty backhauls.

A3 - Manufacturing of the product, including all energy and materials required and all emissions and wastes produced. This may include:

- Packaging, including transportation and waste disposal, to make product ready for shipment;
- If packaging is purchased from multiple suppliers, then a weighted average of the transportation distances by mode from all suppliers shall be included in the LCA modeling;
- Average or specific transportation from manufacturing site to recycling/reuse/landfill for pre-consumer wastes and unutilized by-products from manufacturing, including empty backhauls; and
- Recycling/reuse/energy recovery of pre-consumer wastes and by-products from production.

Module A1, A2, and A3 and the total A1-A3 shall be shown separately.

All assumptions from LCA shall be described in detail.

LCA results for production, installation, use, and end-of-life stages shall be declared separately in the EPD.

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

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

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

## 7.0 Life-Cycle Inventory Analysis

### 7.1 | DATA COLLECTION AND DESCRIPTION OF DATA

Data quality requirements with regard to precision, completeness, consistency, reproducibility and uncertainty are to be followed as per ISO14044:2006, Section 4.2.3.6. The data shall be representative according to temporal, geographical, and technological requirements.

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

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

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

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

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

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

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

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

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

## 7.2 | CUTOFF RULES

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

If data are not reasonably available, the cutoff criteria for flows to be considered within the system boundary shall be as follows:

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

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

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

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

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

## 7.3 | SECONDARY DATA QUALITY REQUIREMENTS

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

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

## 7.4 | UNITS

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

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

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

Convert from	To	Multiply by
Square meter (m <sup>2</sup> )	Square foot (ft <sup>2</sup> )	1.076391E+01
Kilogram (kg)	Pound (lb)	2.204622
Mega joule (MJ)	British Thermal Unit (Btu)	9.478170E+02
Degree Celsius (°C)	Degree Fahrenheit (°F)	(°C * 9/5) +32
Cubic meter (m <sup>3</sup> )	Cubic foot (ft <sup>3</sup> )	3.531466E+01
Meter (m)	Foot (ft)	3.281
m <sup>2</sup> K/W	ft <sup>2</sup> Fhr/Btu	5.6783
Metric tonne	Ton	1.102

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

## 7.5 | ALLOCATION RULES

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

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

In the case of slag, a product of steel and iron production, economic allocation shall be used to allocate flows to the slag at the iron or steel production facility.

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

In the case of incineration of wastes for energy production at the primary production site, the combustion emissions shall be allocated to the building product unless the energy is exported.

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

In cases where several similar products are produced by a site or company, these PCR offer the possibility for similar products to be declared as a production-weighted average product in the same EPD provided that the difference between their environmental impacts is less than 5% for each environmental impact category. In cases where the difference is greater than 5%, it shall be permitted to separately report similar products in the same EPD (e.g., in separate columns in a table). If a single value is chosen for each impact category for all products, the value reported shall be the worst performance within the range of variation. It shall be permitted to show arithmetically weighted 'averaged data' in an EPD as supplementary information if found relevant.

## 8.0 Impact Categories and Characterization Factors

Environmental impact category indicators shall be taken from Table 3 for declaring environmental aspects in accordance with ISO 21930:2007, Section 8.2 and ISO 14044:2006.

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

MEASURES TO BE DECLARED	Unit
Impact category	
Global warming potential (GWP)	kg CO <sub>2</sub> equiv
Acidification potential	kg SO <sub>2</sub> equiv
Eutrophication potential	kg N equiv
Smog creation potential	kg O <sub>3</sub> equiv
Ozone depletion potential	kg CFC-11 equiv
Total primary energy consumption	
Nonrenewable fossil	MJ (HHV)
Nonrenewable nuclear	MJ (HHV)
Renewable (solar, wind, hydroelectric, and geothermal)	MJ (HHV)
Renewable (biomass)	MJ (HHV)
Material resources consumption	
Nonrenewable material resources	kg
Renewable material resources	kg
Net fresh water (inputs minus outputs)	L
Non-hazardous waste generated	kg
Hazardous waste generated	kg

*Notes for Table 3:*

1. Fresh water is naturally occurring water on the earth's surface and underground as groundwater in aquifers and underground streams. The term specifically excludes seawater and brackish water, but does include fresh water that has been treated to make it potable. Energy use and other impacts associated with fresh water treatment are not included.
2. Consumption of net fresh water includes fresh water entering the system being studied that is not returned to the same drainage basin that it originated from.
3. Recovered or recycled materials are neither nonrenewable nor renewable resources under ISO definitions. The use of such materials can be reported as additional environmental information as per Section 9.
4. Primary energy is an energy form found in nature that has not been subjected to any conversion or transformation process. Examples of primary fuels are coal and natural gas.
5. Recycled and recovered materials with fuel content and used as fuels shall be considered alternative energy. Examples of such secondary fuels include but are not limited to solvents, wood, tires, and animal fat. Emissions from secondary fuels shall be included in the calculation of the relevant environmental impacts.
6. Energy consumption shall be reported in Higher Heating Values (HHV) mega joules.

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

## 9.0 Additional Environmental Information

An EPD shall include, where relevant, additional information, such as given in the points below, related to environmental issues, other than the environmental information derived from LCA, LCI, or information modules. This information shall be separated from the information described in ISO 21930:2007, Sections 7.2.2 and 7.2.3. Identification of the significant environmental aspects should, as a minimum, take into consideration the following as per ISO 21930:2007:

- Information on environmental issues, such as:
  - Impact(s) and potential impact(s) on biodiversity,
  - Toxicity related to human health or the environment or both, and
  - Geographical aspects relating to any stages of the life cycle (for example, a discussion on the relation between the potential environmental impact(s) and the location of the product system);
- Data on building product performance if environmentally significant;
- Organization's adherence to any environmental management system, with a statement on where an interested party can find details of the system;
- Any other environmental certification program applied to the building product and a statement on where an interested party can find details of the certification program;
- Other environmental activities of the organization, such as participation in recycling or recovery programs or renewable energy credits (REC), provided details of these programs are readily available to the purchaser or user and contact information is provided;
- Information that is derived from LCA but not communicated in the typical LCI- or LCIA-based formats;
- Instructions and limits for efficient use;

- Hazard and risk assessment on human health and the environment;
- Information on absence or level of presence of a material in the product that is considered of environmental significance in certain areas (see ISO 14021:1999, Sections 5.4 and 5.7);
- Preferred waste management option for used building products; and
- Potential for incidents that can have impact(s) on the environment, such as:
  - the end-of-life stage, from deconstruction, reuse, demolition, recycling and disposal;
  - energy, water-saving, etc. and other improvements, such as acoustical improvements;
  - energy content of the building product for energy recovery in the end of life;
  - recycled content (see ISO 14021:1999) or recycling rates.

Additional information shall only be related to environmental issues. Information and instructions on product safety unrelated to the environmental performance of the building product shall not be part of a Type III environmental declaration (ISO 14025:2006, ASTM 7.2.3).

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

## 10.0 EPD Supporting Data

A project report shall be prepared in accordance with the requirements and guidance of ISO 14044:2006, Section 5, for third-party reports. This information shall document the LCA study and additional environmental information in a systematic, comprehensive way, and shall be made available to the verifier in order to demonstrate that the requirements of this PCR document and ISO 21930:2007, Section 7.3, have been met. The project report shall include, where relevant:

- The name of the organization that commissioned the report, the contact information of the report author, and the date of the report;
- The input and output environmental data of the unit processes that are used for the LCA calculations;
- The documentation (measurements, calculations, estimates, sources, correspondence, traceable references to origin, and so forth) that provides the basis from which the process data for the LCA is formulated;
- The specification used to create the manufacturer's products;
- Energy consumption figures;
- Emission data to air, water, and soil;
- Waste production;
- Data that demonstrates that the information is complete—in specific cases, reference can be made to, for instance, standards or quality regulations;
- Referenced literature and databases from which data have been extracted;
- Data used to carry out sensitivity analyses;
- Documentation that demonstrates that the building products can fulfill the desired function(s) and performance;
- Documentation that demonstrates that the chosen processes and scenarios in the flow chart satisfy the requirements set in ISO 21930:2007;



- Documentation that substantiates the chosen life-cycle of the building products;
- Documentation and substantiation of the percentages or figures used for the calculations in the end-of-life stage;
- Documentation and substantiation of the percentages and figures (number of cycles, prices, and so forth) used for the calculations in the allocation procedure;
- Information showing how averages of different reporting locations have been calculated to obtain proxy data;
- Documentation used to substantiate any qualitative information in the additional environmental information;
- Procedures used to carry out the data collection (questionnaires, instructions, informative material, confidentiality agreements, and so forth);
- The characterization factors used;
- The criteria and substantiation used to determine the system limits and the selection of input and output flows;
- Documentation that demonstrates consistency when using information modules; and
- Documentation used to substantiate the other choices and assumptions.

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

## 11.0 Content of the EPD

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

### Demonstration of Verification

PCR review, was conducted by: < name and organization of the chair, and information on how to contact the chair through the program operator >
Independent verification of the declaration and data, according to ISO 14025: internal                  external
(Where appropriate <sup>1</sup> ) Third party verifier: <name of third party verifier>

<sup>1</sup> Optional for business to business communication, mandatory for business to consumer communication.

All Type III environmental declarations in a product category shall follow the format and include the parameters as identified in this PCR. The following general information shall be declared in the EPD:

- Name and address of the manufacturer(s);
- Product identification by name (including, for example, production code) and a simple visual representation of the product;
- Description of the building product's use and the functional or declared unit of the product to which the data relates;
- Description of the application (installation) of the building product where relevant;
- Detailed list of the substances, by weight, that make up the building product, taking into account cutoff rules and confidentiality;
- Data from LCA or LCI or information modules, as per ISO 14025:2006, Section 7.2.2;
- Additional environmental information (see Section 9);
- Statement of whether the EPD is Cradle-to-Gate or Cradle-to-Grave;
- Statement that EPDs from different programs (using different PCR) may not be comparable;
- Statement that the EPD represents an average performance in cases where an EPD declares an average performance for a number of products, with information on the deviation of the product's performance with respect to the average stated;
- Site(s), manufacturer or group of manufacturers, or those representing them, for whom the results of the LCA are representative;
- Information on where explanatory material may be obtained;
- Description or diagram of the life-cycle stages included in the LCA subdivided into production, construction, use and end-of-life stages, and system boundaries;
- When the EPD includes the use stage, a description of the nature of the processes and ancillary materials that are required for installing the building product in the building or other type of construction works and their replacement and maintenance according to the cutoff criteria;
- Name of the program and the program operator's address and, if relevant, the logo and website URL;
- Identification of the PCR document on which the EPD is based;
- Date the EPD was issued and period of validity;
- Name of PCR review panel chair;
- Whether the independent review of the EPD and data was conducted by an internal or external verifier (third-party verification is mandatory for BtoC EPDs); and
- Name, address, phone number, fax number, and e-mail of the third-party verifier and logo of the verification body, if applicable.

ISO 14025:2006 Section 9.2.2 states that, "Type III environmental product declarations intended for business-to-consumer communication shall be available to the consumer at the point of purchase."

## 12.0 References

### ASTM Standards:<sup>2</sup>

- C33/C33M-13 Standard Specification for Concrete Aggregates
- C144-11 Standard Specification for Aggregate for Masonry Mortar
- C330/C330M-14 Standard Specification for Lightweight Aggregates for Structural Concrete
- C331/C331M-14 Standard Specification for Lightweight Aggregates for Concrete Masonry Units
- C332-09 Standard Specification for Lightweight Aggregates for Insulating Concrete
- C637-14 Standard Specification for Aggregates for Radiation-Shielding Concrete
- C1797-16e1 Standard Specification for Ground Calcium Carbonate and Aggregate Mineral Fillers for Use in Hydraulic Cement Concrete
- D692/D692M-15 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
- D1073-16 Standard Specification for Fine Aggregate for Asphalt Paving Mixtures
- D1139/D1139M-15 Standard Specification for Aggregate for Single or Multiple Bituminous Surface Treatments
- D4992-14e1 Standard Practice for Evaluation of Rock to be Used for Erosion Control
- D5106-15 Standard Specification for Steel Slag Aggregates for Bituminous Paving Mixtures
- D6092-14 Standard Practice for Specifying Standard Sizes of Stone for Erosion Control
- D6155-13 Standard Specification for Nontraditional Coarse Aggregates for Bituminous Paving Mixtures
- D6711-15 Standard Practice for Specifying Rock to Fill Gabions, Revet Mattresses, and Gabion Mattresses

### ISO Standards:<sup>3</sup>

- ISO 6707-1: 014 Buildings and Civil Engineering Works—Vocabulary—Part 1: General Terms
- ISO 14021:1999 Environmental Labels and Declarations—Self-declared Environmental Claims (Type II Environmental Labeling)
- ISO 14025:2006 Environmental Labels and Declarations—Type III Environmental Declarations—Principles and Procedures
- ISO 14040:2006 Environmental Management—Life Cycle Assessment—Principles and Framework
- ISO 14044:2006 Environmental Management—Life Cycle Assessment—Requirements and Guidelines
- ISO 14050:2009 Environmental Management—Vocabulary

<sup>2</sup> Available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, <http://www.astm.org>.

<sup>3</sup> Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, <http://www.iso.org>.

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

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

Other References:

BS EN 15804 Sustainability of construction works—Environmental product declarations—Core rules for the product category of construction products<sup>4</sup>

<sup>4</sup> European Committee for Standardization (CEN), Avenue Marnix 17, B-1000 Brussels, Belgium, [www.cen.eu](http://www.cen.eu)