



## **Product Category Rule (PCR) Guidance for Building-Related Products and Services**

### **Part B: Aluminum Construction Product EPD Requirements**

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**Publisher:**  
UL Environment

**Tracking of versions**

Version	Comments	History
1.0	Creation of PCR Part B for Aluminum Construction Products to conform with ISO 21930:2017 and UL Part A.	xxxx, 2021

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This PCR is valid for a period of five (5) years, set to expire in xxxxxxxx, 2026.

**I. Background Information and Acknowledgements**

These sub-category Product Category Rules (PCR) were developed to address the product specific rules for the creation of Environmental Product Declarations (EPD) for "aluminum construction products". It includes both raw materials such as primary and secondary aluminum ingots and all semi-fabricated or fabricated aluminum products such as including extruded aluminum, cold-formed aluminum sections, flat/hot-rolled aluminum sheet and plate, and shape-casted aluminum products, and product finishing operations, used and/or sold in North America. The scope of this PCR applies to products that can be considered as precursor inputs into other supply chains as well as "semi-fabricated" products, and finished aluminum products. North America includes Canada, Mexico, and the United States. At the discretion of the Program Operator, this PCR may be applicable to other aluminum construction products not specifically described herein and not covered by other existing PCRs. The products within scope are collectively referenced throughout this PCR as "aluminum construction products". When used to self-reference this document, "PCR" refers to "sub-category PCR."

Other documents considered in the development of this PCR include:

- PCR Guidance-Text for Building Related Products and Services. Part B: Requirements on the EPD for Products of Aluminium and Aluminium Alloys. IBU. version 1.6, November 2017.<sup>1</sup>
- PCR Guidance for Building Related Products and Services. Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels 10/20
- Part A: Life Cycle Assessment Calculation Rules and Report Requirements UL Environment December 2018, version 3.2)
- The Environmental Footprint of Semi-Finished Aluminum Products in North America – A Life Cycle Assessment Report. Aluminum Association. 2021<sup>13</sup>.
- ISO 21930: 2017 - Sustainability in building construction -- Environmental declaration of building products
- EN 15804: 2019 - Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction product.

This PCR assumes a minimum 75 year building service life to be consistent with ASHRAE 189.1 (2017, section 9.5.1.2.b) and International Green Construction Code 2018 section 901.5.1.2.

**Interested Parties**

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

- Aluminum Association
- Aluminum Association of Canada (AAC)
- Aluminum Extruder's Council (AEC)
- Carbon Leadership Forum
- Groupe AGECO
- Hydro Aluminum

<sup>1</sup> Compared to the IBU PCR, this PCR is broader in scope, is applicable to North America, and references the core UL Part A.

**Commented [LA1]:** For input

**Commented [If2R1]:** I believe we should explicitly reference aluminum extrusions. Also, do we want to reference finishes on these "aluminum construction products"

**Commented [If3R1]:** Also, do we want this to specifically reference aluminum construction products ... or a more general "products of aluminum and aluminum alloys"

**Commented [LA4R1]:** Should this PCR apply to products beyond building and construction?

**Commented [LA5]:** Boundaries in relation to ingot product and fabricated, finished products

1. Ingot
2. Fabrication
3. Finished Products

Extruder could be providing product for a range of applications; raw material for future operation

Need to be very clear about what's included in boundaries of reporting - will additional finishing be needed?

**Commented [LA6]:** Consider including AA LCA report schematic and modifying to include other aluminum operations such as forging  
Marshall will modify graphic and upload to sharepoint for discussion.

**Commented [AL7R6]:** 7/20 - Marshall to send illustrations to Isabella for three different production boundaries.

**Commented [af8]:** Would also add reference to "Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels 10/20"

PCR for Building-Related Products and Services:  
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- Metal Construction Association (MCA)
- Rio Tinto
- University of Calgary

#### **Governance**

There are a number of representatives of aluminum manufacturers participating in the creation of this Product Category Rule ("PCR") for aluminum construction products, including those listed in the previous section. These parties represent a majority of the companies in the aluminum construction product industry. Moreover, the manufacturing parties participating in the PCR update represent the vast majority of the aluminum construction products sold in North America in the product categories included in this PCR. The very purpose and function of a trade association is to inform its members of important industry developments and to represent their interests in projects such as the update of a PCR affecting their products. This is important because it effectively demonstrates that a large percentage of the aluminum construction product industry is represented in the effort to renew the PCR.

In the development of this document, Part B, participants are responsible for ensuring alignment with Part A and conformance with the scoped standards: ISO 21930, EN 15804<sup>2</sup>, and ISO 14025.

#### **Involvement of Interested Parties**

UL Environment shall be responsible for producing the PCR document by establishing an open consultation process that includes the involvement of interested parties (ISO 21930 Section 5.2 and 6.2.1). Reasonable efforts were made to achieve a consensus throughout the process (ISO 14020:2000, 4.9.1, Principle 8 and cited in both ISO 14025 and ISO 21930), demonstrated by a vote of participating interested parties.

All participating industry associations (AEC, MCA, AA, AAC) informed their memberships of the PCR creation through their regularly scheduled association committee meetings, newsletters, e-mail messages, and similar types of outreach. Trade associations operate at the behest of its members, and the fact that trade associations are participating in the update of a PCR for aluminum construction products is an indication that their memberships are aware of this project and have authorized their association to represent them in this important endeavour.

UL Environment posted an open call for participation in this PCR update in August – September 2020 via its standards website, social media outlets, and PCR listserv.

#### **Update Process**

The PCR is valid for a duration of five (5) years from the publication date, at which time it may be revised at the request of industry stakeholders. The PCR may be revised before the five year date if the following occurs in the industry:

- The industry desires an update
- Core governing standards ISO 14040, 14044, 14025, 21930, or EN 15804 are updated with substantial material changes

Note: When the PCR is updated, the Program Operator shall communicate with the original committee, any new EPD participants, and initiate a new public call for interested parties.

#### **Public Consultation**

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

<sup>2</sup> There are several compatibility issues with ISO 21930 and EN 15804 which are specifically noted in this Part A (See Section **Error! Reference source not found.**). Whenever compatibility issues arise, whether addressed in this Part A or not, the requirements in ISO 21930 shall take precedence over EN 15804. If it is necessary for an EPD to explicitly conform to EN 15804 and not ISO 21930, this precedence will not apply.



review panel and public consultation were addressed and satisfactorily resolved by the PCR committee prior to the publication of this PCR.

**Review**

The review process of this Part B PCR included a review through public consultation from xxxx -- xxxxxx, 2021 and a panel review, comprised of the following individuals:

TBD	T	TBD
	B	
	D	

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**II. Glossary**

Commented [LA9]: Marshall to populate with definitions

- Aluminum plate
- Aluminum sheet
- Cast products
- Extrusions
- Fabricated aluminum (can be finished or unfinished)
- Finished product
- Forged products
- Primary ingot
- Recycled specific ingot (RSI)
- Semi-fabricated aluminum

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**III. Scope**

This document contains the Product Category Rule (PCR) requirements for Aluminum Construction Product Environmental Product Declarations (EPDs) published in coordination with the ISO 21930 and EN 15804 standards. The requirements for the background Life Cycle Assessment (LCA) project report used to inform the EPD are contained in UL Environment's Part A: Life Cycle Assessment Calculation Rules and Report Requirements. This Part B document, coupled with the Part A, conforms to the ISO 21930, EN 15804<sup>3</sup>, and ISO 14025 sustainability standards for EPD reporting in addition to the US Green Building Council PCR Guidance.

**General Guidance**

<sup>3</sup> See footnote 2.



The scope of this PCR applies to the product group "aluminum construction products" and includes mill level products (cast and forged), cold-rolled aluminum, extruded/drawn aluminum, and hot-rolled aluminum sheet and plate and other fabricated/manufactured products made primarily of aluminum used and/or sold in North America according to those listed in Section 10, Appendix.

Products considered under the scope of this PCR may be anodized, coated, thermally ~~cut~~ improved, welded, and/or machined.

This PCR applies to products sold and used in the North American market. PCRs and EPDs created for aluminum products in geographies outside of North America do not necessarily conform with this PCR and are not applicable for use in the North American market.

### Non-Applicable Products

The following products, which may provide similar functions in a different application, are not within the scope of this PCR:

1. [Products containing no aluminum metal](#)
2. [Mineral aluminum products \(non-metal\) \(such as products that contain aluminum oxides, e.g. ceramic glazes or aluminum coatings\)](#)
3. [Aluminum cladding products shall use the UL Cladding PCR](#)
4. [Products where aluminum foil is used as a barrier \(e.g. conductive, thermal, radiative\)](#)

### System Boundary

The system boundary for EPDs created using this PCR is either:

- [Cradle to gate \(modules A1-A3\)](#) or
- [Cradle to gate with options \(modules A1-A3, modules C1-C4\) or](#)
- Cradle to gate with options (modules A1-A3, modules C1-C4, and module D)

EPDs produced under this PCR do not include fabricated products, where the input is a semi-fabricated product; e.g. curtain wall, roofing. Suppliers of semi-fabricated products may provide product conversion factors based on material properties so that EPD users can calculate embodied emission impacts for fabricated products.

The EPDs produced under this PCR do not cover the operational impacts of the whole building. In most/many applications, aluminum products have little to no maintenance or replacement and do not result in emissions to air or water. It is the production of these construction products, not the impacts from the operational phase of a whole building, which are the subject of EPDs covered by this PCR.

Care must be taken when assigning system boundaries around A1-A3 based on the operations involved and the end product.

The EPD requirements include:

- [ISO 21930:2017 standard](#)
- [EN 15804:2012+A2:2019 standard \(optional\)](#)
- ULE General Program Instructions v 2.5, March 2020 (available upon request)
- The calculation rules for the Life Cycle Assessment and Requirements on the Project Report are specified in a separate document as Part A v3.2 of the Product Category Rules. [The most recent version of the Part A shall be used when publishing an EPD](#), available at <https://www.ul.com/offerings/product-category-rules-pcrs>

### EPD Updates

EPDs created using this PCR shall expire five (5) years after publication. An update to the existing EPD, or new EPD, may need to be developed prior to the five year review if any of the following have occurred (non-exhaustive):

**Commented [LA10]:** For input. What do we want to call out in the scope?

Profiles, precision profiles, bars tubes, sheets, strip and wires?

**Commented [If11R10]:** "Products considered under the scope ... may be mill finish, anodized, coated, thermally improved, welded ...

**Commented [LA12]:** Marshall to work with Andy suggest language for committee discussion.

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**Commented [af13]:** Review MCA document for boundary limits also. They are quite detailed.

**Commented [LA14R13]:** Andy to post MCA EPD to ensure we're aligning.

**Commented [LA15]:** What system boundaries do we want to allow?

Is there any scenario use phase should be reported?

**Commented [If16R15]:** AEC's existing EPD is cradle to gate with options: modules A1-A3, C4, and D. We need that option

**Commented [AL17]:** Steph: Designers are translating DU's into FU's (length, area) using density and other parameters when it comes to modelling and scaling.

Potentially add language in PCR that allows application of conversion factors to arrive upon end products.

**Commented [AL18R17]:** Lynn: Other industries such as auto use this information on a mass/weight basis to make the translation to other fabricated products.

PCR for Building-Related Products and Services:  
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- 1) Significant changes in the manufacturing process;
- 2) New manufacturers wish to participate but are disqualified for retroactive participation on the basis of provided data (industry-average EPDs);
- 3) Significant changes or alterations in raw materials;
- 4) Major regulatory changes that mandate or trigger changes to operational procedures; or
- 5) Major technological changes.



## III.IV. Industry-Average EPD Requirements

### Industry-Average EPD Scope

The products represented within a single industry-average EPD created using this PCR are limited to the primary materials defined in the product specification standards in Section 9 that characterize the specific product in commerce.

### Involvement of Interested Parties

A call for involvement of interested parties in the creation of an industry-average EPD shall be published in at least one industry trade publication [and/or communication](#). At a minimum, at least three (3) different manufacturing locations from no less than three (3) companies should be involved and represented in an industry-average EPD. The method for determining representativeness shall be justified and described per Section 2.2.2.

**Commented [JW19]:** Add: or trade association news letter and notice to its members

### Industry-Average EPD Participation

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

### Retroactive participation

When determining a manufacturer's participation eligibility, the EPD Program Operator shall follow the rules and recommendations of the primary sponsor(s) of the industry average EPD and participating manufacturers.

If deemed eligible, a manufacturer desiring retroactive inclusion in the industry average EPD shall provide manufacturing and product data information of the same representativeness submitted in the original industry average EPD to the LCA practitioner. The LCA practitioner will then recommend to the Program Operator a determination for inclusion in the industry average on the basis of results falling within a reasonable range for any impact category. ~~The maximum and minimum should be reported in the LCA background report for the original industry-average EPD shall include a sensitivity analysis for each impact category that serves as the basis for determining retroactive inclusion, based on the highest and lowest impact product or facility within the original industry-average LCA.~~

**Commented [lf20]:** This appears to be new. Is that right? And is this per participant or per operating facility

### Governance

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

**Commented [LA21R20]:** Yes, this is new and designed to be flexible in terms of how the average is calculated (per company, product, facility) for purposes of retroactive inclusion.

The development of an industry-average EPD and/or update of an EPD should involve a series of meetings and exchanges in which all participants are invited and kept apprised of the developments. Notices of these meetings should be given to all possible participants regardless of their commitment to active involvement. Minutes of meetings, along with meeting notices, should be preserved as documentation of the process and due diligence observed in the creation or renewal of the EPD.

### Data Responsibility/Ownership

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

Per ISO 21930 Section 5.4, 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 the PCR. Only the manufacturer or group of manufacturers is authorized to declare the environmental performance of the construction product using an EPD.

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



**1. Content of the EPD**

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	Program Operator Provided
GENERAL PROGRAM INSTRUCTIONS & VERSION	Program Operator Provided
MANUFACTURER NAME AND ADDRESS	
DECLARATION NUMBER	Program Operator Provided
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	
REFERENCE PCR AND VERSION NUMBER	
DESCRIPTION OF PRODUCT'S INTENDED APPLICATION AND USE (AS IDENTIFIED WHEN DETERMINING PRODUCT RSL, IF APPLICABLE)	
PRODUCT RSL DESCRIPTION (IF APPL.)	
MARKETS OF APPLICABILITY	
DATE OF ISSUE	Program Operator Provided
PERIOD OF VALIDITY	Program Operator Provided
EPD TYPE	[Industry-average or product-specific]
DATASET VARIABILITY	[Industry-average only; mean, median, standard deviation, range of recycled content]
EPD SCOPE	[Cradle to gate, cradle to gate with options (specify options)]
YEAR(S) OF REPORTED PRIMARY DATA	
LCA SOFTWARE & VERSION NUMBER	
LCI DATABASE(S) & VERSION NUMBER	
LCIA METHODOLOGY & VERSION NUMBER	
The sub-category PCR review was conducted by:	Program Operator Provided
	Program Operator Provided
	Program Operator Provided
This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," v3.2 (December 2018), in conformance with ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017)	
	Program Operator Provided

Commented [If22]: are these options?



<input type="checkbox"/> INTERNAL	<input type="checkbox"/> EXTERNAL	
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:		Program Operator Provided
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:		Program Operator Provided
<p><b>LIMITATIONS</b></p> <p>The environmental impact results of aluminum products in this document are based on a declared unit and therefore do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the aluminum product impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted. See Section 3.10 for additional EPD comparability guidelines.</p> <p>Environmental declarations from different programs (ISO 14025) may not be comparable.</p>		

## 2. General Information

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

### 2.1. DESCRIPTION OF ORGANIZATION

#### 2.1.1. PRODUCT SPECIFIC EPD

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

#### 2.1.2. INDUSTRY AVERAGE EPD

The name of the sponsoring organization as well as participating manufacturers shall be provided or linked via URL.

### 2.2. PRODUCT DESCRIPTION

EPDs created using this PCR shall specify whether the declared product is:

1. Ingot
2. Semi-fabricated (input is ingot or scrap, product is hot-rolled, cold-rolled)

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

#### 2.2.1. PRODUCT IDENTIFICATION

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

Example: Anodized aluminum extrusions are used in a variety of applications in the window and door projects. . These products are extruded into shapes such as channels that are detailed, cut, drilled, welded, anodized, and otherwise processed at the fabricator in order to prepare them for installation.

#### 2.2.2. PRODUCT SPECIFICATION

Related products grouped and reported as an average product in the same EPD satisfying the variation criteria of Part A, Section 2.5 shall constitute an individual declared product. For each declared product, list the physical



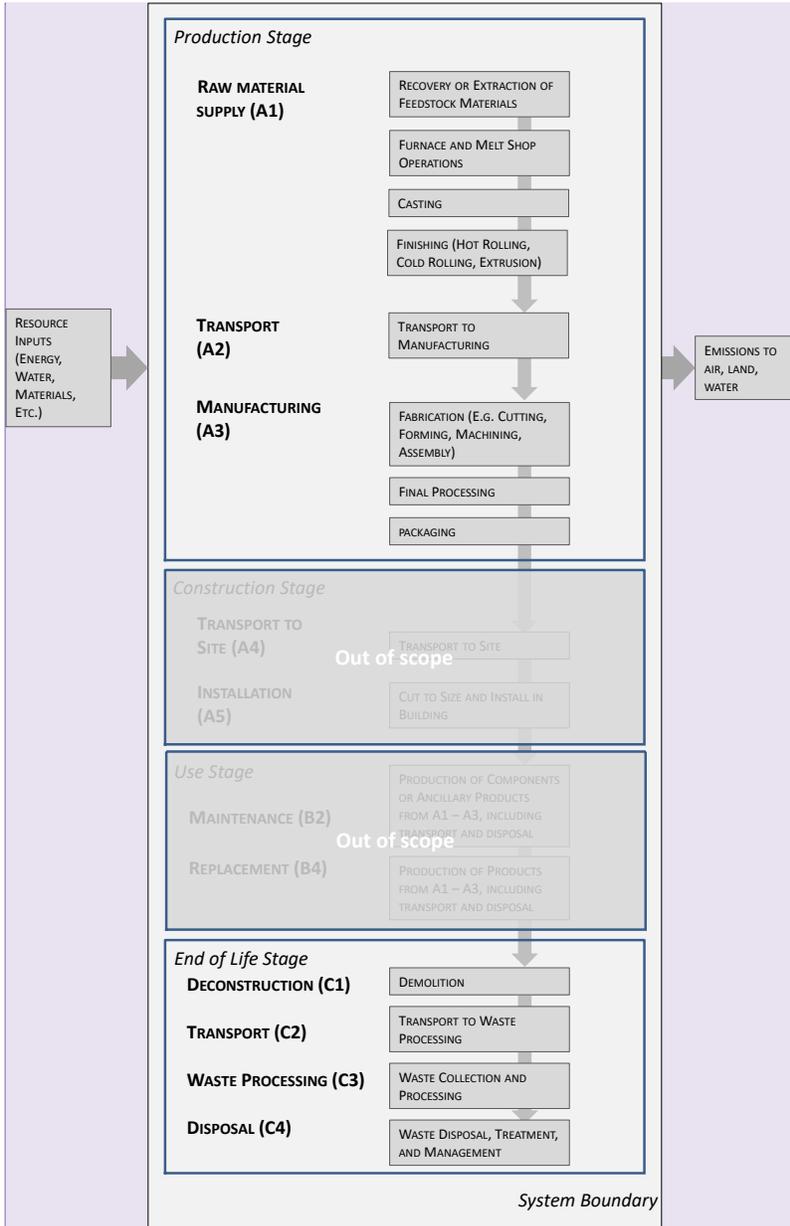
characteristics – in the form that the product would be installed – along with the reference to the test standard for each. When pertinent, provide a description of the aluminum construction product. Other relevant product specification values may be provided here.

**2.2.3. FLOW DIAGRAM**

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



FIGURE 1. EXAMPLE PRODUCT FLOW DIAGRAM<sup>4</sup>



**Commented [AL23]:** Modify diagram to put finishing in "A3" - boundary for A3 is semi-fabricated products



### 2.3 PRODUCT AVERAGES FOR EPDS

#### 2.3.1 Product Specific EPD

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

#### 2.3.2 Industry Average EPD (if relevant)

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

The industry average EPD shall disclose the mix of traceable primary aluminum sourced and report geographic mix of origin.

### 2.4. APPLICATION

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

### 2.5. MATERIAL COMPOSITION

The main product components or materials that make up the product shall be described and given in percentage by mass, including shares of primary and recycled materials. Recycled material by preconsumer and postconsumer source should be included. The source of primary material, at a regional or country level, should be stated. Materials and components include, but are not limited to, general categories such as aluminum and coatings.

Statements of material non-inclusion, such as "... is free of ..." may not be used. Ancillary materials and additives remaining in the product shall also be declared.

Regulated Hazardous substances and dangerous substances shall be reported per Part A, Section 4.11; there are no additional reporting requirements for this PCR.

**Commented [JW24]:** Shares of primary and recycled materials should be included. Recycled material by preconsumer and postconsumer source should also be included. Source of primary material, at a regional or country level, should be stated.

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

Note: Aluminum products used inside the building envelope (e.g. used in load-bearing applications present inside wall structures) do not include materials or substances which may have any potential route of exposure to humans or flora/fauna in the environment.

### 2.6. TECHNICAL REQUIREMENTS

The appropriate ASTM or CSA product specification shall be provided, including additional pertinent physical properties and technical information. The following technical data for the product as delivered shall be provided with reference to the applicable test standard.- A supplier may provide additional information that allows other conversions to be calculated based on the reported declared unit.

TABLE 1. TECHNICAL DATA

Name	Value	Unit
GROSS DENSITY		kg/m <sup>3</sup>
MELTING POINT		°C
ELECTRICAL CONDUCTIVITY AT 20°C		m/Ωmm <sup>2</sup>
THERMAL CONDUCTIVITY		W/mK

**Commented [af25]:** This is probably a standard list, but the existing MCA PCR does not include Conductivity



COEFFICIENT OF THERMAL EXPANSION		10 <sup>-6</sup> K <sup>-1</sup>
MODULUS OF ELASTICITY		N/mm <sup>2</sup>
SHEAR MODULUS		N/mm <sup>2</sup>
SPECIFIC HEAT CAPACITY		kJ/kgK
HARDNESS		HB
YIELD STRENGTH RP 0.2 MIN		N/mm <sup>2</sup>
TENSILE STRENGTH RM MIN		N/mm <sup>2</sup>
TENSILE STRESS AT BREAK		%
CHEMICAL COMPOSITION		-

Commented [If26]: These appear to be new. Necessary?

**2.7. PROPERTIES OF DECLARED PRODUCT AS DELIVERED**

A link to the final evaluation report/certification/registration may be provided.

**3. Methodological Framework**

The following items shall be specified: the type of EPD with respect to life cycle stages, and the life cycle stages covered and not covered.

**3.1. DECLARED UNIT**

A declared unit shall be applied if the precise function of the product is not stated or not known. The declared unit shall be one (1) metric ton for aluminum construction products. Conversion factors (e.g. density, thickness, surface area, etc.) shall be provided in order to allow the users to conduct further calculations (e.g. transport impacts).

Commented [LA27]: One ton or one kg?

Commented [If28R27]: I vote for one metric ton

Environmental Impact results based on a declared unit of an aluminum product do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the aluminum product impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted. See Section 5.1 for additional EPD comparability guidelines.

**3.2. SYSTEM BOUNDARY**

**3.2.1. GENERAL**

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

Capital goods and infrastructure flows shall be excluded from the product system boundary.

**3.2.2. MODULE D**

Module D reports the potential benefit or burden from the displacement of primary materials and/or fuels associated with recycling and recovery at end-of-life. When optional Module D is reported in an EPD, the EPD shall explicitly describe the methodology used to calculate the reported values, including the LCI of scrap used in calculations, and shall address any uncertainty or comparability issues relative to these values. If Module D is reported, the EPD shall include the following paragraph:

*Interpreting the Results in Module D: The values in Module D include a recognition of the benefits or impacts related to aluminum recycling which occur at the end of the product's service life. The rate of aluminum recycling and related processes will evolve over time. The results included in Module D attempt to capture future benefits, or impacts, but are based on a methodology that uses current industry-average data reflecting current processes.*



### 3.3. ALLOCATION

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

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

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

### 3.4. CUT-OFF RULES

Cut-off rules as specified per the Part A, Section 2.9 shall be used and documented in the EPD and LCA report. All known mass and energy flows shall be reported. No known flows should be deliberately excluded. Environmental impacts are associated with the creation of scrap and these impacts may be optionally reported in Module D.

### 3.5. DATA SOURCES

Data sources shall be documented per Part A, Section 3.1.

The source of primary aluminum shall be stated in the EPD, including geographic origin(s) and grid(s). If the source of primary aluminum is unknown, an industry average shall be assumed and justified.

Commented [LA29]: Define?

All aluminum datasets shall be the most recent, representative, regional-average datasets published by xxxx, unless data is available from the specific aluminum supplier for the construction product covered by the EPD. Any deviation from the requirements of ISO 21930:2017 (e.g. physical allocation for co-products) in background datasets shall be justified and described.

Commented [LA30]: Do we want to specify data sources?

In situations where secondary data is used to represent a key unit process, secondary data shall include a regionally appropriate electricity supply mix.

Commented [If31R30]: Believe it is advantageous if we specify sources.

### 3.6. DATA QUALITY

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

### 3.7. PERIOD UNDER REVIEW

The period under review and ensuing averages shall be documented.

### 3.8. COMPARABILITY AND BENCHMARKING

Comparison of EPD results between non-competitive<sup>5</sup> products may be conducted per the requirements in Part A, Section 9.

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified.

When comparing EPDs that include Module D, the calculation method(s) used to determine impacts and benefits must be identical.

<sup>5</sup> Here, non-competitive means a product comparison with an industry average or comparison between two products manufactured by the same producer.



Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison.

Environmental impact results based on a declared unit of an aluminum product do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the aluminum product impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted.

### 3.9. ESTIMATES AND ASSUMPTIONS

Key assumptions and estimates in throughout Section 3 and 4 should be included in the LCA and EPD.

Default assumptions for module C should be as follows unless justified otherwise with primary data:

- Demolition impacts are assumed to be negligible compared with the rest of the product life cycle<sup>6</sup>
- Recovery and recycling rate – 95%<sup>7</sup>
- Product transport from building site to waste processing
  - Mode: Diesel-powered truck/trailer
  - Distance: 100 km

### 3.10. UNITS

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

## 3. Technical Information and Scenarios

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

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

### 4.1. MANUFACTURING

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

### 4.2. DISPOSAL

The possible disposal channels shall be indicated in accordance with disposal routes and waste classification referenced in Part A, Section 2.8.5 and 2.8.6.

<sup>6</sup> Currently there are no published data sources for energy (e.g. diesel and electricity) consumption during building demolition. This assumption can be updated in the future if an appropriate data source is found.

<sup>7</sup> Includes commercial and residential buildings. Based on Nationwide survey to aluminum and steel shredders. Delft U study. UL TO ADD OTHER CITATIONS

**Commented [LA32]:** Chris to dig up reference for default assumptions for module C1.

**Commented [LA33R32]:** Chris Devades: Study from Delft U that has been referenced by EU Aluminum Association.

**Commented [LA34R32]:** Option to only include C2, C3, C4?

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**Commented [LA35]:** Marshall to provide aluminum specific number from association report.

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**TABLE 1. END OF LIFE (C1-C4)**

Name		Value	Unit
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)			
Collection process (specified by type)	Collected separately		kg
	Collected with mixed construction waste		kg
Recovery (specified by type)	Reuse		kg
	Recycling		kg
	Landfill		kg
	Incineration		kg
	Incineration with energy recovery		kg
	Energy conversion (specify efficiency rate)		
Disposal (specified by type)	Product or material for final deposition		kg
Removals of biogenic carbon (excluding packaging)			kg CO <sub>2</sub>

**4.3. BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)**

Refer to Section 3.2.2 for discussion and describe methodology used to calculate Module D, if reported. Note that information modules C1 to C4 shall be declared when module D is declared.

**TABLE 2. BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D), RELEVANT SCENARIO INFORMATION**

Name	Value	Unit
Recycling rate of product		%
Recycled content of product		%

**5. Environmental Indicators Derived from LCA**

**5.1. LCA RESULTS FROM LCIA**

In Table 3, "Description of the system boundary," all declared modules shall be indicated with an "X".

Modules A1, A2, and A3 shall be declared as separate modules.

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

**Commented [JW36]:** Industry average LCA is done through calculating a weighted average. Weights are based on the percentage shares of outputs of each unit process by a data reporting facility. It is thus impossible to report a range for LCIA indicators. The same is true for "median".



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

Per Part A, life cycle impact assessment (LCIA) results shall be declared using scientific notation with three significant digits (e.g. 1.23E-5 = 0.0000123) for each module. Uniform formatting shall be used for all indicator values.

- Required: North America (Part A, Section 4.7, Table 9)
- Optional: EU (Part A, Section 4.8, Table 10)
- Optional: Rest of World (Part A, Section 4.9, Table 11)

The following statements on comparability shall immediately follow the LCIA results table in an EPD:

**Comparability:** Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.

Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

TABLE 3. DESCRIPTION OF THE SYSTEM BOUNDARY MODULES

EPD Type	PRODUCTION			CONSTRUCTION		USE							END OF LIFE				BENEFITS & LOADS BEYOND SYSTEM BOUNDARY	Reference Service Life
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
	Raw material supply	Transport	Manufacturing	Transport to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential	
Cradle to gate	Required			Excluded							Depending on Part A, Section 2.8.4.5				Excluded	Optional		
Cradle to gate with options	Required			Excluded							Required				Optional	Optional		
Declared Modules (Indicate with "X")																		

5.2. LCA RESULTS FROM LCI

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

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



## 6. LCA: Interpretation

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

An interpretation shall be provided in the EPD which discusses the assumptions and limitations associated with the interpretation of results as declared in the EPD, both methodology and data related.

This interpretation shall also include a description of the time frame and/or variance of the LCIA results if the EPD is valid for several products. An illustration of the results with figures is recommended in the EPD, e.g. for the dominance analysis, the distribution of impacts across the modules, the CO<sub>2</sub>-balance, etc. as appropriate for a reader's understanding of the environmental profile of the declared product.

For industry-average EPDs, The EPD shall include a sensitivity analysis shall be included that clearly shows the variability between the following parameters that allows users to change values to recalculate results: relationship between

1. Recycled vs. primary inputs, that allows users to change values to calculate median results
2. Where the primary aluminum is produced.

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## 7. Additional Environmental Information

### 7.1. RESULTS FOR UNFINISHED ALUMINUM

In addition to reporting results for Modules A1, A2, and A3 for fabricated products within the scope of this PCR (see Scope section), disaggregated results for Module A1 may additionally be reported for the production of mill product. These results shall be reported on the basis of one (1) metric ton.

### 7.2. ENVIRONMENT AND HEALTH DURING MANUFACTURING

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

### 7.3. ENVIRONMENT AND HEALTH DURING INSTALLATION

Information should be provided in this section on the relationship between the product, the environment and health, including any possible harmful substances or emissions e.g. reference to a product safety data sheet (SDS). Any recommendations concerning cleaning, maintenance, etc. of the declared product should be listed in Section 4 "Technical information on scenarios". In establishing safe thresholds of exposure for humans, measures such as Reference Concentrations (RFC) or Reference Dose (RD) can be used, which are established by US EPA and available in the Integrated Risk Information System database. In establishing safe thresholds of exposure for flora/fauna, measures such as Criteria Maximum Concentration (CMC) or Criterion Continuous Concentration (CCC) can be used, also established by US EPA and available as part of the National Recommended Water Quality Criteria. Other data sources can be used to establish safe thresholds of exposure for humans and flora/fauna, with justification.

### 7.4. ENVIRONMENTAL ACTIVITIES AND CERTIFICATIONS

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

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

### 7.5. FURTHER INFORMATION

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



## 8. Project Report and Supporting Documentation

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

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

## 9. References

The literature referred to in the Environmental Product Declaration shall be cited. Standards and standards relating to evidence and/or technical features already cited in the EPD do not need to be listed here. This Part B PCR document shall be referenced.

### UL ENVIRONMENT

UL Environment General Program Instructions March 2020, version 2.5

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

### SUSTAINABILITY REPORTING STANDARDS

EN 15804:2019-04 - Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction product.

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 21930:2017 - Sustainability in building construction -- Environmental declaration of building products

Product Category Rule Guidance Development Initiative. Guidance for Product Category Rule Development. (August 28, 2014, version 1.0).

### RELEVANT FEDERAL STANDARDS AND SOPs

Environment Canada, National Pollutant Release Inventory (NPRI) (<http://www.ec.gc.ca/inrp-npri>)

EPCRA 313 Toxic Release Inventory Reporting (U.S.) (<https://www.epa.gov/toxics-release-inventory-tri-program>) Accessed 08 December 2017.

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

### RELEVANT PCRS

PCR Guidance-Text for Building Related Products and Services. Part B: Requirements on the EPD for Structural Aluminum. IBU. version 1.6, November 2017.

### ASTM STANDARDS



ASTM B221-13/B221M-13 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

ASTM B429/B429M-10e1 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

ASTM B491/B491M-06 Standard Specification for Aluminum and Aluminum-Alloy Extruded Round Tubes for General-Purpose Applications

## 10. Appendix

The scope of this PCR applies to the product group “steel construction products” and includes mill level products, fabricated structural steel, cold-formed steel sections, concrete reinforcing steel products, and other fabricated/manufactured products made primarily of steel used and/or sold in North America including, but not limited to, the following standards and specifications.

### STRUCTURAL STEEL

The elements included in the scope of this PCR for structural steel are defined in the AISC 303-16 Code of Standard Practice for Steel Buildings and Bridges, Section 2, Classification of Material.

### COLD-FORMED STEEL SECTIONS

The shapes included in the scope of this PCR for Cold-Formed Steel Framing structural and nonstructural members/sections are defined in the following standards:

- AISI S100 - American Iron and Steel Institute - North American Specification for the Design of Cold-Formed Steel Structural Members
- AISI S201 - North American Standard for Cold-Formed Steel Framing – Product Data
- AISI S220 - North American Standard for Cold-Formed Steel Framing – Nonstructural Members
- AISI S240 - North American Standard for Cold-Formed Steel Framing – Structural Framing
- AISI D100 - Cold-Formed Steel Design Manual
- ASTM C1047 – Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base

### METAL LATH

- ASTM C847 Standard Specification for Metal Lath

### CONCRETE REINFORCING STEEL

The steel reinforcing bars included in the scope of this PCR are those defined in one of the following specifications:

- ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
- ASTM A767/767M - Standard Specification for Deformed and Plain Zinc-Coated Steel Bars for Concrete Reinforcement
- ASTM A775/A775M - Standard Specification for Deformed and Plain Epoxy Coated Reinforcing Steel Bars
- ASTM A934/A934M - Standard Specification for Deformed and Plain Epoxy Coated Prefabricated Reinforcing Steel Bars

### CORRUGATED STEEL PIPE

The corrugated steel pipe included in the scope of this PCR are those defined in one of the following specifications:

- CSA G401 (2014) - Corrugated Steel Pipe
- ASTM A742/A742M-13 - Standard Specification for Steel Sheet, Metallic Coated and Polymer Precoated for Corrugated Steel Pipe

**Commented [LA37]:** This is currently relevant for steel; needs to be updated for aluminum

What are different “groups” of aluminum?



- ASTM A929/A929M-17- Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe

#### **ROLL FORMED STEEL PANELS**

Steel cladding, roofing and deck products defined in the scope of this PCR are those defined in of the following specifications:

- ANSI/SDI C-2017 - Standard for Composite Steel Floor Deck – Slabs
- ANSI/SDI RD-2017 - Standard for Steel Roof Deck
- ANSI/SDI NC-2017 – Standard for Non-Composite Steel Floor Deck
- CSSBI 20M-17 - Standard for Sheet Steel Cladding for Industrial, Commercial and Institutional Building Applications
- CSSBI 21M-17 - Standard for Steel Farm Roofing and Siding
- CSSBI 23M-15 - Standard for Residential Steel Cladding
- CSSBI S8-18 - Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products
- CSSBI 22M-17 - Standard for Residential Steel Roofing

#### **Applicable Products**

The following Construction Specification Institute (CSI) Masterformat codes and UNSPSC codes cover the scope of this Part B. These lists are non-exhaustive and may include other relevant steel construction products:

- 03 20 00 Concrete Reinforcing
- Corrugated Steel Pipe
- Steel Cladding
- Steel Roofing
- 03 21 00 Reinforcement Bars
- 03 21 11 Plain Steel Reinforcement Bars
- 03 21 13 Galvanized Reinforcement Steel Bars
- 03 21 16 Epoxy-Coated Reinforcement Steel Bars
- 03 21 19 Stainless Steel Reinforcement Bars
- 05 10 00 Structural Metal Framing
- 05 12 00 Structural Steel Framing
- 05 12 13 Architecturally-Exposed Structural Steel Framing
- 05 12 16 Fabricated Fireproofed Steel Columns
- 05 12 19 Buckling Restrained Braces
- 05 12 23 Structural Steel for Buildings
- 05 13 00 Structural Stainless-Steel Framing
- 05 21 00 Steel Joist Framing
- 05 31 00 Steel Decking
- 05 40 00 Cold-Formed Metal Framing
- 05 41 00 Structural Metal Stud Framing
- 05 42 00 Cold-Formed Metal Joist Framing
- 05 42 13 Cold-Formed Metal Floor Joist Framing
- 05 42 23 Cold-Formed Metal Roof Joist Framing
- 05 43 00 Slotted Channel Framing
- 05 44 00 Cold-Formed Metal Trusses
- 09 21 16 Gypsum Board Assemblies
- 09 21 16.23 Gypsum Board Shaft Wall Assemblies
- 09 22 16 Non-Structural Metal Framing
- 09 22 36.23 Metal Lath

Corresponding applicable UNSPSC codes include:

- 30103614 - Steel plate joist
- 30103618 - Steel framework
- 30103623 - Reinforcing bar or rebar or mesh
- 302636 - Carbon steel bars

PCR for Building-Related Products and Services:  
Aluminum Construction Product EPD Requirements



- 302637 - Steel alloy bars
- 302638 - Tool steel bars
- 302639 - Specialty steel bars
- 302640 - Carbon steel sheets
- 302641 - Steel alloy sheets
- 302642 - Specialty steel sheets
- 302643 - Specialty steel coils
- 302644 - Carbon steel ingots strips billets and coil
- 302645 - Stainless steel bars
- 302646 - Stainless steel sheets
- 302647 - Stainless steel coil
- 302648 - Stainless steel strips

**Non-Applicable Products**

Products that may provide the same function in a different application are not within the scope of this PCR. These excluded products are:

- Non-steel products