



**Product Category Rule (PCR)
for Preparing an
Environmental Product Declaration (EPD)
for Product Group**

Cladding System Products

**VERSION (June 18, 2015)
VALID THROUGH (June 18, 2019)**

PRODUCT CATEGORY RULE

Cladding Product Systems

Versions overview

Version	Description	History
1	Version by UL Environment with input from external committee and accepted by an external review panel	6/18/2015

Editor's Notes:

This proposed **PCR** is based on modifications made to existing **PCR** from other countries that address **CLADDING PRODUCT SYSTEMS**.

This **PCR** was modified to reflect the North American circumstances, conformity with existing cladding standards, and conformity with the reference standard ISO 21930. Revisions/discussion points to make this **PCR** applicable to the U.S. include: **UNITS, FUNCTIONAL UNIT**, impact assessment methods, testing methods and requirements, use phase options, references, and standards.

This **PCR** is intended to serve the global B2B and B2C markets, reflecting the global manufacturing and distribution networks for these products. It is expected that region-specific versions of this **PCR** will not differ significantly.

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PROGRAM OPERATOR: *UL Environment*

The **PCR** has been prepared by UL Environment with input from a coalition of the following interested parties:

- American Wood Council
- James Hardie
- Vinyl Siding Institute

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Definitions

For the purposes of this document, the following terms and definitions are per ANSI/SDI A250.7, ISO 14040:2006, ISO 14044, 14025: 2006, ISO 21930 and EN 15804 apply.

ANCILLARY INPUT – input material or product that is used by a **UNIT PROCESS** during the life cycle of the **CLADDING PRODUCT SYSTEMS**, but which does not constitute part of the **CLADDING PRODUCT SYSTEMS** [adjusted from ISO 14040].

AVERAGE DATA – data representative of a product, product group or construction service, provided by more than one supplier [EN 15804].

CAPACITY UTILIZATION – in the context of transportation, a percentage indicating the actual capacity utilized versus potential freight capacity when transporting goods. Also known as load factor or capacity utilization factor.

COMPARATIVE ASSERTION – environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function [ISO 14044].

CO-PRODUCT – any of two or more products coming from the same **UNIT PROCESS** or **PRODUCT SYSTEM** [ISO 14044].

DECLARED UNIT – quantity of **CLADDING PRODUCT SYSTEM** for use as a **REFERENCE UNIT** in an EPD for an environmental declaration based on one or more **INFORMATION MODULES** [EN 15804 adapted from ISO 21930]; See also **FUNCTIONAL UNIT**. The **DECLARED UNIT** is used where the **FUNCTIONAL UNIT** and the reference scenario for the whole life cycle, on the building level, cannot be stated.

DOMINANCE ANALYSIS – an analytical quantitative (such as statistical) or qualitative ranking technique (such as ABC analysis), by means of the relative significance of contributions are examined [adjusted from ISO 14044].

DUMMY – term used by US LCI database that refers to “empty” LCI data sets in technosphere processes.

ESTIMATED SERVICE LIFE (ESL) – The average **ESL** of a building in North America is defined to be 75 years.

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FUNCTIONAL UNIT – quantified performance of a **PRODUCT SYSTEM** for a building product for use as a **REFERENCE UNIT** in an EPD based on **LCA** [ISO 21930 adapted from ISO 14040].

INFORMATION MODULE – compilation of data to be used as a basis for a **TYPE III ENVIRONMENTAL DECLARATION** covering a **UNIT PROCESS** or a combination of **UNIT PROCESSES** that are part of the life cycle of a product [ISO 14025].

INTEGRATED BUILDING TECHNICAL SYSTEM (IBTS) – as adapted from EN 15804, the installed technical equipment supporting operation of a building. This includes technical building system for HVAC, lighting, domestic hot water and other system for sanitation, security, fire safety, internal transport and building automation and control and IT communication [EN 15804]. Some **CLADDING PRODUCT SYSTEMS** may be part of the security, fire-safety, and other aspects of **IBTS**.

LIFE CYCLE ASSESSMENT, LCA – compilation and evaluation of the inputs, outputs and the potential environmental impacts of a **PRODUCT SYSTEM** throughout its life cycle [ISO 14044].

LIFE CYCLE INVENTORY, LCI – phase of **LIFE CYCLE ASSESSMENT** involving the compilation and quantification of inputs and outputs for a product throughout its life cycle [ISO 14040].

LIFE CYCLE IMPACT ASSESSMENT, LCIA – phase of **LIFE CYCLE ASSESSMENT** aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a **PRODUCT SYSTEM** throughout the life cycle of the product [ISO 14040].

MSDS – Material Safety Data Sheet. A document that accompanies hazardous chemicals and substances and outlines the dangers, composition, safe handling, and disposal of said chemicals and substances.

NON-RENEWABLE ENERGY – energy from sources which are not defined as **RENEWABLE** energy sources [EN 15804]

NON-RENEWABLE RESOURCE – resource that exists in a finite amount that cannot be replenished on a human time scale [ISO 21930].

PCR REVIEW – process whereby a **THIRD PARTY** verifies the **PRODUCT CATEGORY RULE** [ISO 14025].

PRODUCT CATEGORY RULE, PCR – set of specific rules, requirements and guidelines for developing **TYPE III ENVIRONMENTAL DECLARATIONS** for one or more product categories [ISO 14025].

PRODUCT SYSTEM – collection of **UNIT PROCESSES** with elementary and product flows, performing one or more defined functions, and which models the life cycle of the product [ISO 14040]

PROGRAM OPERATOR– body or bodies that operate a **TYPE III ENVIRONMENTAL DECLARATION** program [ISO 14025].

*Note: A **PROGRAM OPERATOR** can be a company or a group of companies, industrial sector or trade association, public authorities or agencies, or an independent scientific body or other organization.*

REFERENCE UNIT- measure of the outputs from processes in a given **PRODUCT SYSTEM** required to fulfil the function expressed by the **FUNCTIONAL UNIT** [ISO 14044] over the **ESL** of the building or the **RSL** of the **CLADDING PRODUCT SYSTEM** .

*Note: In ISO Standards, **REFERENCE UNIT** and **REFERENCE FLOW** are used interchangeably. In this **PCR** only **REFERENCE UNIT** is used.*

REFERENCE SERVICE LIFE, RSL – service life of a **CLADDING PRODUCT SYSTEM** which is known to be expected under a particular set, i.e., a reference set, of in-use conditions and which may form the basis of estimating the service life under other in-use conditions [ISO 21930].

REFERENCE SERVICE LIFE DATA, RSL DATA – Information that includes the **RSL** and any qualitative or quantitative data describing the validity of the **RSL**. Example- typical data describing the validity of the **RSL** include the description of the component for which it applies [ISO 15686-8].

RENEWABLE ENERGY – energy from **RENEWABLE** non-fossil sources [EN 15804].

Examples: wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.

RENEWABLE RESOURCE – Resource that is grown, naturally replenished or naturally cleansed, on a human time scale [ISO 21930].

*Note: A **RENEWABLE RESOURCE** is capable of being exhausted, but may last indefinitely with proper stewardship. Examples include: trees in forests, grasses in grassland, fertile soil.*

SDS – Safety Data Sheet. A document that accompanies hazardous chemicals and substances and outlines the dangers, composition, safe handling, and disposal of said chemicals and substances. Constructed and formatted to conform to the Globally Harmonized System (GHS), which mandates SDS's have 16 standardized sections arranged in a strict order.

SECONDARY FUEL – fuel recovered from previous use or from **WASTE**, which substitutes primary fuels [EN 15804].

*Note 1: Processes providing a **SECONDARY FUEL** are considered from the point where the **SECONDARY FUEL** enters the system from the previous system.*

*Note 2: Any combustible material recovered from previous use or from **WASTE** from the previous **PRODUCT SYSTEM** and used as fuel in a following system is a **SECONDARY FUEL**.*

Note 3: Examples for primary fuels are: coal, natural gas, biomass, etc.

*Note 4: Examples for **SECONDARY FUELS** recovered from previous use or as **WASTE** are: spent solvents, wood from demolition or forest slash or as bark or sawdust, tires, used motor or cooking oil, and animal fats.*

SECONDARY MATERIAL – material recovered from previous use or from **WASTE**, which substitutes primary materials [EN 15804].

*Note 1: **SECONDARY MATERIAL** is measured at the point where the **SECONDARY MATERIAL** enters the system from another system.*

*Note 2: Materials recovered from previous use or from **WASTE** from one **PRODUCT SYSTEM** and used as an input in another **PRODUCT SYSTEM** are **SECONDARY MATERIALS**.*

*Note 3: Examples for **SECONDARY MATERIALS** (to be measured at the system boundary) are recycled scrap metal, crushed concrete, glass cullet, recycled wood chips, recycled plastic.*

THIRD PARTY – person or body that is recognized as being independent of the parties involved, as concerns the issues in question. Note-"parties involved" are usually supplier ("first party") and purchaser ("second party") interests [ISO 14024].

TYPE III ENVIRONMENTAL DECLARATION – Environmental declaration providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information [EN 15804: adapted from ISO 14025].

Note: The calculation of predetermined parameters is based on the ISO 14040 series of standards, which is made up of ISO 14040, and ISO 14044. The selection of the predetermined parameters is based on ISO 21930.

UNIT - the set of the fewest **CLADDING PRODUCT SYSTEM** elements which comprise one complete **CLADDING SYSTEM**, together with the fasteners or other forms or attachment required to affix the product to the building. More than one **UNIT** may be required in use, but less than one **UNIT** cannot perform the required function.

UNIT PROCESS – the smallest element considered in the **LCI** for which input and output data are quantified [ISO 14040].

WATER CONSUMPTION – water removed from but not returned to the same drainage basin

Note 1: WATER CONSUMPTION can be because of evaporation, transpiration, product integration or discharge into a different drainage basin or the sea. Evaporation from reservoirs can be included in WATER CONSUMPTION [ISO/DIS 14046].

Note 2 Refer to ISO 14046 for all terms relating to types and classifications of water and water footprint assessment.

WASTE – substances or objects that the holder intends or is required to dispose of [ISO 14040].

References

1. General Standards and Code Requirements for CLADDING PRODUCT SYSTEMS

- International Residential Code (IRC), Chapter 7 – Wall Covering
- International Building Code (IBC), Chapter 14 – Exterior Walls

2. General and Building Sector Specific ISO Standards and others for LCA, PCR and EPDs

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ISO 14040: 2006 Environmental management -- Life cycle assessment -- Principles and framework

ISO 14044: 2006 Environmental management -- Life cycle assessment -- Requirements and guidelines

ISO 14025: 2006 Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures

ISO/DIS 14046:2013, Environmental management- Water footprint- Principles, requirements and guidelines

ISO 15392:2008, Sustainability in building construction- General principles

ISO 15686-1:2011, Buildings and constructed assets- Service life planning- Part 1: General principles

ISO 15686-8:2008, Buildings and constructed assets- Service life planning Part 8: Reference service life and service life estimation

ISO 21930: 2007 Sustainability in building construction -- Environmental declaration of building products

EN 15804: 2012 Sustainability of construction works. Environmental Product Declarations. Core rules for the product category of construction products

3. Federal Standards and SOPs

40 CFR 50 Protection of Environment - Part 50: National Primary and Secondary Ambient Air Quality Standards (U.S.) (<http://www.epa.gov/air/criteria.html>)

CAA 112(r) Clean Air Act (U.S.)
(http://www.epa.gov/oem/docs/chem/caa112_rmp_factsheet.pdf)

CERCLA Hazardous Substances (U.S.)
(<http://www.epa.gov/oem/content/hazsubs/cerclsubs.htm>)

EPCRA 313 Toxic Release Inventory Reporting (U.S.)
(<http://www.ecy.wa.gov/ePCRA/section313.html>)

OSHA 1910.1200 Hazardous Communication Standard—Toxic and Hazardous Substances (U.S.)

(http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10099)

U.S 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

4. Relevant PCR

This PCR is based on revisions made to existing PCR, including:

- Part B: Aluminum roofing and cladding systems v. 1.5 (Institut Bauen und Umwelt e.V. (IBU))
- Part B: Ceramic paneling v.1.5 (IBU)
- Part B: Dimension stone for roof, wall and floor applications v.1.5 (IBU)
- Part B: Double skin metal faced sandwich panels v.1.5 (IBU)
- Part B: Fibre cement v.1.5 (IBU)
- Part B: Frame systems with a covering made of glass-polytetrafluoroethylene (PTFE) membrane v.1.5 (IBU)
- Part B: Glass reinforcement mesh v.1.5 (IBU)
- Part B: Laminates v.1.5 (IBU)
- Part B: Building metals v. 2 (IBU)
- Part B: Self-supporting façade elements based on glazed curtain walls v.1.5 (IBU)
- Insulated Metal Panels & Metal Composite Panels, and Metal Cladding: Roof and Wall Panels v.1 (UL Environment)
- North American Structural and Architectural Wood products v1.1 (FP Innovations)
- NPCR 015 rev1 Wood and wood-based products for use in construction (The Norwegian EPD Foundation)

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Revisions/discussion points to make this PCR applicable to the US and inclusive of all cladding materials include: inclusion of technical performance and use-phase references applicable to the US market, updates to functional and declared units to be consistent across material categories (where applicable), The revisions are intended to reflect practices, methods and requirements that are specific to the United States.

List of Abbreviations

For the purposes of this document, the following abbreviations are per ISO 14040:2006, ISO 14044, 14025: 2006, ISO 21930 and EN 15804:

ADPE – Abiotic Depletion Potential for Non-Fossil Resources
ADPF – Abiotic Depletion Potential for Fossil Resources
ANSI – American National Standards Institute
AP – Acidification Potential of Soil and Water
ASTM – American Society for Testing and Materials
BH – Builders Hardware
CAA – Clean Air Act (U.S)
CDM – Clean Development Mechanism
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
CFR – Code of Federal Regulations
CPS – Construction Process Stage
CRU – Components for Reuse
DIS – Draft International Standard
EEE – Exported Electrical Energy (waste to energy)
EET – Exported Thermal Energy (waste to energy)
EN – European Standard
EP – Eutrophication Potential
EPA – Environmental Protection Agency
EPCRA – Emergency Planning and Community Right-to-Know Act
EPD – Environmental Product Declaration
FW – Net Consumption of Water
GWP – Global Warming Potential
HVAC – Heating, Ventilation, and Air Conditioning
IBTS – Integrated Building Technical System
HWD – Hazardous Waste Disposed
IBU – Institute Construction and Environment

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IBC – International Building Code
ISO – International Organization for Standardization
LCA – Product Life Cycle Assessment
LCI – Life Cycle Inventory
LCIA – Life Cycle Impact Assessment
LEED – Leadership in Energy and Environmental Design
LHV – Lower Heating Value (net caloric value)
MET – Materials for Energy Recovery
MFR – Materials for Recycling
MSDS – Material Safety Data Sheet
NHWD – Non-Hazardous Waste Disposed
NRSF – Use of Non-Renewable Secondary Fuel
ODP – Depletion Potential of the Stratospheric Ozone Layer
PCR – Product Category Rule
PENRE – Non-Renewable Primary Energy and Energy Carrier
PENRM – Non-Renewable Primary Energy as Material Utilization
PERE – Renewable Primary Energy as Energy Carrier
PERM – Renewable Primary Energy as Material Utilization
PERT – Total Use of Renewable Primary Energy Resources
PM – Particulate Matter
POCP – Formation Potential of Tropospheric Ozone
RSF – Use of Renewable Secondary Fuel
RSL – Reference Service Life
RWD – Radioactive Waste Disposed
SM – Use of Secondary Material
VER – Verified Emission Reduction

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1.0 Introduction to the PRODUCT CATEGORY RULES (PCR)

1.1 Purpose of the PCR

The intended application of this **PRODUCT CATEGORY RULE (PCR)** document is to provide a common set of specific rules, requirements and guidelines for developing ISO 14025 conformance Type III Environmental Product Declarations (EPDs) for **CLADDING PRODUCT SYSTEMS** produced for use in North America and to specify the underlying requirements of the **LCA** in conformance with ISO 14040 series of **LCA** standards and the ISO 21930 standard. For example, these PCR facilitate the creation of Environmental Product Declarations that will satisfy green standards, programs, and codes.

The primary users of this **PCR** will be North American or global cladding manufacturers.

This **PCR** document does not address either the economic or social aspects of **CLADDING PRODUCT SYSTEMS**.

1.2 Scope of the PCR

This PCR is valid for **CLADDING PRODUCT SYSTEMS** produced for use in North America. The Scope of this PCR includes:

- Cladding Product Systems, including all available building cladding products and their fasteners or other method of attachment, regardless of material type, as defined in the International Residential Code (IRC) and International Building Code (IBC).
- Cladding consists of materials applied to a building exterior to separate a building from the natural environment and provide an outer building skin or layer, including but not limited to, veneers, siding, exterior insulation and finish systems, architectural trim, and embellishments such as cornices, soffits, and fascias. Cladding provides control of weather elements to safely direct water and wind, and control run-off and infiltration of other foreign objects into the building structure. Cladding also provides a durable, aesthetically pleasing building appearance. Secondary roles can include, but are not

limited to, sound and thermal insulation, structural performance, fire resistance, and the capacity for cleaning in polluted environments.

- Solar panel cladding products are excluded from the scope of this PCR. These products are excluded on the basis that their primary function is not as cladding, but to generate electricity.
- The products considered in this PCR fall under UNSPSC codes:
 - 30161505 Panels or paneling
 - 30151800 Siding and exterior wall materials
 - 30151802 Siding
 - 30151807 Exterior trim material

1.3 Period of Validity of the PCR

This PCR is valid for a period of 5 (five) years from the date of the publication. This PCR may be revised sooner by the primary users identified in Section 1.1.

1.4 Content of the PCR

This PCR specifies the rules for the **CLADDING PRODUCT SYSTEMS PRODUCT CATEGORY** as regards to:

- the calculation criteria for the **LIFE CYCLE ASSESSMENT (LCA)**,
- the rules for the creation of a Background Report on the **LCA**, and
- the rules for the creation of the Environmental Product Declaration (EPD).

1.5 Harmonization

In developing this PCR, UL Environment took every effort to harmonize the PCR development work with existing PCR for cladding products. The PCR development process, for instance, began with a search for existing valid PCR on this particular product category. The following PCR documents from the German Institute for Construction and Environment (IBU), FP Innovations, UL Environment, and The Norwegian EPD Foundation were valid and considered in the development of this PCR:

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- Product Category Rules for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU): *Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report, Sep 2011*
- PCR Guidance-Texts for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU)
- Part B: Aluminum roofing and cladding systems v. 1.5 (Institut Bauen und Umwelt e.V. (IBU))
- Part B: Ceramic paneling v.1.5 (IBU)
- Part B: Dimension stone for roof, wall and floor applications v.1.5 (IBU)
- Part B: Double skin metal faced sandwich panels v.1.5 (IBU)
- Part B: Fibre cement v.1.5 (IBU)
- Part B: Frame systems with a covering made of glass-polytetrafluoroethylene (PTFE) membrane v.1.5 (IBU)
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- Insulated Metal Panels & Metal Composite Panels, and Metal Cladding: Roof and Wall Panels v.1 (UL Environment)
- North American Structural and Architectural Wood products v1.1 (FP Innovations)
- NPCR 015 rev1 Wood and wood-based products for use in construction (The Norwegian EPD Foundation)

The aforementioned PCR were modified for North American circumstances for the following reasons:

- The IBU PCR strictly follow the EN 15804:2012 standard, developed by regulatory and policy organizations in the European Union and developed by European experts rightly reflecting the interests, practices, and supply chain aspects in the EU. The PCR development team recognized the need for developing a separate PCR, compliant with ISO 14025 and ISO 21930, for **CLADDING PRODUCT SYSTEMS** manufactured for use in North America but not necessarily conformant with EN 15804;
- The IBU PCR require applying European category-impact-characterization factors. Instead, the USA Environmental Protection Agency's Tools for the Reduction and

Assessment of Chemical and other environmental Impacts (TRACI) system of characterization factors shall be applied for North American **CLADDING PRODUCT SYSTEM LCA** reports and **EPDS**;

- The **IBU PCR** require applying European based background **LCI** data sources. Instead, data sources representative of North American circumstance and conditions (e.g., US **LCI** database, US **EI** database, etc.) shall be used for North American **CLADDING PRODUCT SYSTEM LCA** reports and **EPDS**;
- The **IBU PCR** are based on European technical requirements and reference standards which are different from North American standards. As specified in Section 2, North American reference standards and technical requirements shall be used to describe the North American **CLADDING PRODUCT SYSTEM**;
- The **IBU PCR** documents follow a specific format. It consists of a generic **IBU PCR Part A** document applicable for all **CLADDING PRODUCT SYSTEM** and a product specific **IBU PCR Part B**. This North American **PCR** adopts a different format and is a standalone document;
- The **IBU PCR** follows European regulations for hazardous and toxic materials and substances. North American regulations are different from European regulations. This North American **CLADDING PRODUCT SYSTEM PCR** specifies hazardous and toxic materials and substances in accordance with regulations applicable in the North American countries for which the **PCR** is to be valid;

Despite the above variations, the **PCR** team adopted almost all **LCA** technical aspects of the **IBU PCR**, for instance -

- Definition of **DECLARED UNIT** (in some instances),
- The modular approach,
- **PRODUCT SYSTEM** boundary,
- Life cycle stages definition and processes,
- Environmental parameters derived from **LCA** including parameters describing environmental impacts, parameters describing resource use, and parameters describing different **WASTE** categories and output flows,
- Additional technical information for the optional “construction, use and end-of-life” life cycle stages,
- Additional environmental information during the use stage which is not covered by the **LCIA**,
- Allocation rules,
- The **EPD** content template, etc.

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in order to develop this North American **CLADDING SYSTEM PCR** and maintain a consistent approach to PCR development.

2.0 Rules for Completing the LCA and Background Report

A **LIFE CYCLE ASSESSMENT (LCA)**, **LIFE CYCLE INVENTORY (LCI)** and/or **INFORMATION MODULES**, complying with ISO 14040/14044, describing the **CLADDING PRODUCT SYSTEM** and based on transparent and credible data, must be presented in the Background Report to support the EPD. Additionally, model assumptions with a significant influence on the declared results must be clearly stated in the Background Report and the EPD.

The **LCA** Background Report shall be made available to the verifier with the requirements on confidentiality stated in ISO 14025. The Background Report is not part of the public communication.

The life-cycle stages which are taken into account in the Assessment must be thoroughly presented in relation to the considered processes. The Product Stage must always be thoroughly presented. Construction Process, Use, and End-of Life Stages are defined as optional. If included, assumptions and key parameters considered in these optional stages must be clearly stated.

COMPARATIVE ASSERTIONS with other products shall not be made. The Background Report and EPD shall comply with the format specified in Section 2.2 of this document.

2.1 Rules for Completing the LIFE CYCLE ASSESSMENT

2.1.1 Product Category Definition

The **CLADDING PRODUCT SYSTEM PRODUCT CATEGORY** encompasses available building cladding products and their fasteners or other method of attachment, regardless of material type.

Cladding consists of materials applied to a building exterior to separate a building from the natural environment and provide an outer building skin or layer, including but not limited to, veneers, siding, exterior insulation and finish systems, architectural trim, and embellishments

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such as cornices, soffits, and fascias. Cladding provides control of weather elements to safely direct water and wind, and control run-off and infiltration of other foreign objects into the building structure. Cladding also provides a durable, aesthetically pleasing building appearance. Secondary roles can include, but are not limited to, sound and thermal insulation, structural performance, fire resistance, and the capacity for cleaning in polluted environments.

2.1.2 DECLARED UNIT/ FUNCTIONAL UNIT

The declared unit is defined as:

- 100 sq. ft of product, as manufactured

The **REFERENCE UNIT** is the total mass of material in one declared unit. The declared unit and the mass reference in pounds (lbm) must be indicated.

As required in ISO 21930, Clause 6.2.3, information provided using a **DECLARED UNIT** shall not be used for purposes of comparing **CLADDING PRODUCT SYSTEM** EPDs. According to Clause 5.6 of ISO 21930, “Comparison of building products using EPD shall be carried out only at the building level” and shall follow the requirements for comparability, as described in ISO 14025:2006, Clause 4 and 5.

A **DECLARED UNIT** is used instead of a **FUNCTIONAL UNIT** when the precise function of the product or scenario(s) at the building level is not stated or is unknown throughout the cradle-to-grave life cycle. A **DECLARED UNIT** provides a reference by means of which the material flows of the **INFORMATION MODULES** of **CLADDING PRODUCT SYSTEMS** are normalized (in a mathematical sense) to produce data, expressed on a common basis [ISO 21930], to one unit.

Based on ISO 14044, a **PRODUCT SYSTEM** may fulfil a number of possible functions and the one(s) selected for a **LCA** study depend(s) on the goal and scope of the **LCA**.

For a particular **LCA**, not all functions may be relevant and the relevant ones must be identified. The **FUNCTIONAL UNIT** quantifies the performance characteristics of the identified functions of the **CLADDING PRODUCT SYSTEM**, for use as a **REFERENCE UNIT** in an EPD.

FUNCTIONAL UNIT

The functional unit for cladding systems is:

- 100 sq. ft of coverage area of installed product on the exterior of the building frame, including fasteners or other method of attachment, to separate a building from the natural environment and provide an outer building skin or layer for 75 years. The functional unit includes overlap from installation.

The coverage area refers to the projected flat area covered by the product, and accounts for losses due to overlap and scrap during installation. Installation shall not take into account losses due to building fenestration, soffits, fascia, cornices, or other building façade elements.

When a functional unit is used for the purposes of cradle-to-grave reporting, the declared unit shall be considered in the context of a 75 year building lifespan.

This PCR applies to a wide variety of cladding material types, each with its own applicable ASTM standard. Cladding types are offered in different materials with different physical properties such as density, strength, etc. that will directly impact factors such as insulating qualities, moisture barrier, sound absorption. Therefore, to enable a better understanding of a product in its functional context, this PCR requires listing technical parameters for cladding.

If the **FUNCTIONAL UNIT** covers only one function, and additional functions are not taken into account then these omissions shall be explained and documented.

For purposes of defining the **FUNCTIONAL UNIT** and the **REFERENCE UNIT**, an average **ESTIMATED SERVICE LIFE (ESL)** of a building in North America of 75 years shall be applied. The **ESL** is used in this PCR as an analysis period for LCA calculations.

2.1.3 Product Description

The product to be assessed shall be described in reference to its technical and functional properties and its application ranges.

The **LCA** can be conducted for either an average or a specific product (e.g. a representative product with the greatest environmental impact). In the case where an **LCA** is calculated as average environmental performance for product a statement to that effect shall be included in the Background Report together with a description of the range and variability of the **LIFE**

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CYCLE IMPACT ASSESSMENT (LCIA) results. For products produced in multiple locations, the locations of the factories/plants shall be reported in the Background Report.

The Product Description must clearly state the product. For example, if the product is:

- A specific product from a specific factory/plant of a manufacturer,
- A specific product as an average from several of the manufacturer's plants,
- A specific product as an average from the plants of more than one manufacturer,
- An average product from a manufacturer's specific plant,
- An average product as an average from several of the manufacturer's plants, An average product as an average from the plants of more than one manufacturer.

When average products are reported the purposes of industry wide EPDs, the method for determining the average shall be provided.

The EPD shall provide a narrative description of the **CLADDING PRODUCT SYSTEMS** in a manner that enables the user to clearly identify the product. As defined in Section 3.2, this description will include:

- Product description
- Designated application of the product
- Product data
- Technical data, if available, and referenced testing standard (per the table below)
- Market placement / Application rules
- Product formulation
- Manufacturing processes
- Environment and health during manufacturing
- Packaging
- Product installation
- Environment and health during use stage
- **REFERENCE SERVICE LIFE**
- End-of-Life
- Further information (optional)

Technical Construction data

Name	Value	Unit
Length		ft
Width		ft
Thickness		in
Density		lb/ft ³
Tensile strength		lbf/in ² (PSI)
Modulus of Elasticity		lbf/in ² (PSI)
U-value of assembly including interruptions to insulation		BTU/(h °F ft ²)
R value of typical materials where continuous		ft ² ·°F·hr/BTU
Water vapor permeance		perm (inch-pound)
Liquid water absorption		% of dry weight
Airborne sound reduction		dB
Sound absorption coefficient		%

2.1.4 PRODUCT REFERENCE SERVICE LIFE (RSL)

The **REFERENCE SERVICE LIFE** of a **CLADDING PRODUCT** depends on the type of product, its application, the user, and required maintenance of the product.

The **RSL** shall only be specified by the manufacturer for “Cradle-to-building with Use Stage (Option 3)” and “Cradle-to-grave” type of EPDs (see Table 1). The reference service life of a product must be clearly stated in both the Background Report and the EPD and all assumptions in regard to the RSL calculations shall be documented and justified.

2.1.5 System Boundary

LCA is conducted by means of models describing the environmental impacts of elements of the **PRODUCT SYSTEMS** throughout the life cycle of the product to be assessed, from raw

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material supply and manufacturing through use and disposal. The System Boundary for the product is broken into the Stages of Product, which includes extraction and processing of resources; Construction Process; Use, which includes periodic maintenance and replacement and effects on the building's energy performance; and End of Life, which includes separation from the building and final disposition of the product (see Figure 1).

The System Boundary determines which **UNIT PROCESSES** are included in the **LCA** of a **PRODUCT SYSTEM**, and which are not. **PRODUCT SYSTEMS** are sets of **UNIT PROCESSES** and intermediate flows within the System Boundary, together with energy and material (or product) flows into and out of the System Boundary. This section specifies the boundary of the **PRODUCT SYSTEM** for which **LCA** is to be reported and, in particular, the boundary that interfaces with other **PRODUCT SYSTEMS** in the life of a building. It also specifies the processes that are to be included in each of the life cycle stages as listed below.

The **LCA** is organized into Modules that allow easier preparation of data throughout the life cycle of the product. This approach requires that the system boundary for the life cycle stages and the **INFORMATION MODULES** included be transparent, well defined, and applicable to any **CLADDING PRODUCT SYSTEM**.

For the purposes of creating EPDs from this **PCR**, the following life cycle Stages and **INFORMATION MODULES** are considered:

- A1 through A3 Product Stage
- A4 through A5 Construction Process Stage
- B1 through B7 Use Stage
- C1 through C4 End-of Life Stage

Only the declaration of the Product Stage modules, A1 to A3, is required for minimum compliance with this **PCR**. Module aggregation is permitted under this **PCR** for the Product Stage; refer to Section 2.1.5.6 for guidance.

If Use Stage reporting is chosen, (see Table 1), **INFORMATION MODULES** B1-B5 shall be reported for all products.

Table 1
CLADDING PRODUCT SYSTEM EPD types

EPD type	DECLARED UNIT (DU) or FUNCTIONAL UNIT (FU)	Life Cycle Stages and modules	RSL	Primary audience
Cradle to factory gate	DU	Product stage; modules A1 to A3	Not specified	Business-to-business (B to B)
Cradle to factory gate-with options	DU	Product and optional construction, use and EOL stages; modules A1 to A5, and B1 to B6, C1 to C4	Not specified	Business-to-business (B to B)
Cradle to grave	FU	Product, construction, use and EOL stages; modules A1 to C4	RSL is required	Business to business (B to B) and/or Business to consumer (B to C)

Figure 1: Types of EPD with respect to Life Cycle Stages and Modules for CLADDING PRODUCT SYSTEMS ¹

BUILDING ASSESSMENT INFORMATION															
BUILDING LIFE CYCLE INFORMATION															
A 1 – 3			A 4 – 5		B 1 - 7					C 1 – 4					
PRODUCT stage			CONSTRUCTION PROCESS stage		USE stage					END OF LIFE stage					
A 1	A 2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4		
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	De-construction demolition	Transport	WASTE processing	Disposal		
			scenario	scenario		scenario	scenario	scenario	scenario	scenario	scenario	scenario	scenario		
					B6	Operational energy use									
					scenario										
					B7	Operational water use									
					scenario										
EPD	Cradle to gate DECLARED UNIT	Mandatory													No RSL
	Cradle to gate with option DECLARED UNIT/FUNCTIONAL UNIT	Mandatory	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	No RSL
	Cradle to grave FUNCTIONAL UNIT	Mandatory	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	RSL
1) Inclusion for a declared scenario 2) If all scenarios are given															

¹ EN15804: 2014 - Sustainability of construction works – Environmental Product Declarations – core rules for the product category of construction products.

The setting of the system boundary follows two principles:

- The “modularity principle”: Where processes influence the product’s environmental performance during its life cycle, they shall be assigned to the module of the life cycle where they occur; all environmental aspects and impacts are declared in the life cycle stage where they occur;
- The “polluter pays principle”: Processes of **WASTE** processing shall be assigned to the **PRODUCT SYSTEM** that generates the **WASTE** until the “end-of-**WASTE**”² state is reached.

The omission(s) of significant environmental aspects or life-cycle stages shall be justified and documented.

2.1.5.1 Product Stage (includes Modules A1 through A3)

Product Stage includes the provision of all materials, products, and energy and includes **WASTE** processing or disposal of final residues during the product stage. However, production of capital goods, infrastructure, production of manufacturing equipment and personnel-related activities are not included. HVAC (heating, ventilation, and air conditioning), artificial lighting and transport within the Manufacturing site will only be considered if they do not meet the cut-off criteria (see Section 2.1.6).

The Product Stage will account for:

- A1 Extraction and processing of raw materials (e.g. mining and refining processes) and biomass production and processing (e.g. agricultural or forestry operations);
- A1 Reuse of products or materials from a previous **PRODUCT SYSTEM** (i.e. recycled aluminum);
- A1 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**;
- A1 Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport;
- A1 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**;

² See EN 15804:2012 Annex B.1 End-of-waste for decision tree on determining end-of-waste state.

- A2 Transportation up to the factory gate and internal transport;
- A3 Production of **ANCILLARY** materials or pre-products (i.e. lubricants);
- A3 Manufacturing of products and **CO-PRODUCTS**;
- A3 Manufacturing of packaging;
- A1-A3 **WASTE** processing or disposal, including any packaging **WASTE**.

For the Product Stage the boundary is set from raw materials acquisition through to production and the delivery of the finished product ready for dispatch (factory gate). The assessment scope including all processes both considered and neglected shall be described appropriately, and is preferably presented as a flow diagram.

In the case of input of **SECONDARY MATERIALS**, or energy recovered from **SECONDARY FUELS**, the System Boundary between the system under study and the previous system (that is, the source of the **SECONDARY MATERIALS**) is set where outputs of the previous system reach the end-of-**WASTE** stage. In the case of outputs, flows leaving the system at the end-of-**WASTE** boundary of the Product Stage (A1-A3) shall be allocated as they are allocated to **CO-PRODUCTS**.

The flows leaving the system at the A1-A3 boundary are determined as follows:

- Production **WASTE** whose materials are recycled without any modification of the features inherent to the materials within the product system (i.e. closed-loop) can be considered as recycled within Modules A1-A3.
- For production **WASTE** whose materials are reused or recycled anywhere other than in the **PRODUCT SYSTEM** (open-loop), the cut-off method shall be applied
- Heat and power from energy recovery of production **WASTE** in Modules A1-A3 can be considered closed-loop within Module A1-A3 if they are used within Modules A1-A3 and only to the maximum amount in MJ as is required.

All allocation procedures chosen for flows that reach the system at the boundary A1-A3 shall be in conformance with ISO 14044:2006 and shall be justified. The resulting material and energy flows are to be described transparently in the background report with regard to the amounts of materials and energy within Module A1-A3.

Allocation associated with transport should be based on weight or volume, as appropriate for realistic modeling.

2.1.5.2 Construction Process Stage (includes modules A4 and A5)

Modules A4 and A5 are optional and the construction stage will report:

- A4: Transport to the building site
- A5: Installation into the building

Construction Process Stage (CPS) includes provision of all materials, products and energy, and **WASTE** processing or disposal of final residues during the CPS. Also included are all impacts related to any losses of product during this CPS (i.e., the production, transport, and **WASTE** processing or disposal of the lost products and materials).

The CPS includes **INFORMATION MODULES** for:

- A4 Transportation from the manufacturing gate to the construction site
- A4 & A5 Storage of products, including the provision of heating, cooling, humidity control etc.
- A4 & A5 The **WASTE** of product that occurs at the construction site when there is improper installation and the component or product is discarded
- A4 & A5 **WASTE** processing from product packaging and wastage of product during the CPS, up to the end-of-**WASTE** state or disposal of final residues
- A5 Installation of the product in the building including manufacture and transportation of **ANCILLARY** materials and any energy or water required for installation or operation of the construction site.

This module also includes on-site operations to the product.

2.1.5.3 Use Stage

The Use Stage includes the use of construction products, equipment, and services in their proper function. It also includes maintenance (including cleaning), repair, replacement, and refurbishment.

It may be difficult to separate all Use-Stage processes and the connected aspects and impacts into the optional individual Modules B1-B5 and B6-B7 listed below. Any deviation from the listed categorization of aspects and impacts into modules B1-B5 and B6-B7 shall be transparently reported and justified.

2.1.5.3.1 Use Stage Related to the Building Structure (modules B1 through B5)

When incorporating use stage of the product in the building structure, **INFORMATION MODULES** B1 through B5 shall be reported on a cradle to grave EPD and are optional for cradle to gate EPDs.

- B1: Use of the installed product
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment

The **RSL** of **CLADDING PRODUCT SYSTEMS** depends on the type of product, its application, the user, and required maintenance of the product. For this purpose, the Use Stage impacts shall be reported in accordance with the calculated **ESL/RSL** of the product as per Section 2.1.4.

2.1.5.3.1.1 Use of the Installed Product (Module B1)

The Product's **RSL** as defined in Section 2.1.4 shall be used.

This “Use of the installed product”, Module B1, covers environmental impacts and aspects that are not covered by Modules B2-B7 and that arise from the product installed in the building during its normal (i.e. anticipated) use.

It is expected that **CLADDING PRODUCT SYSTEMS** will have no impact in terms of any emissions to environment according to this Module B1; Cladding Product System impact on building energy use (e.g. HVAC) is covered in Module B6.

2.1.5.3.1.2 Maintenance (Module B2)

The “Maintenance” Module covers the combination of all prescribed technical and associated administrative activities required in order to maintain the product installed in a building, construction works, or components in such a way that its requisite functional and technical performance as well as the aesthetic qualities are retained. This includes preventive and regular maintenance activities such as cleaning, prescribed technical service. Water and

energy usage required for cleaning as part of maintenance measures, for example, must be considered in this Module.

The “Maintenance” boundary shall include in addition:

- The production and transportation of any component or **ANCILLARY** product used for maintenance, including cleaning
- Transportation of any **WASTE** from maintenance processes or from maintenance related transportation
- The end-of-life processes of any **WASTE** from transportation and the maintenance process, including any part of the component and **ANCILLARY** materials removed

Required or expected maintenance are to be modeled according to manufacturer’s guidelines. Assumptions and key parameters must be clearly stated and the manufacturer is to submit supporting documentation to justify the assumptions made.

2.1.5.3.1.3 Repair (Module B3)

The module “repair” covers a combination of all technical and associated administrative actions during the service life associated with corrective, responsive, or reactive treatment of a **CLADDING PRODUCT SYSTEM** installed in the building or construction works to return it to an acceptable condition in which it can perform its required functional and technical performance. It also covers the preservation of the aesthetic qualities of the product. Replacement of a broken component or part due to damage should be assigned to “repair”, whereas replacement of a whole element due to damage should be assigned to the module “replacement.”

The boundary for “Repair” must include:

- Repair processes of the repaired part of a component including:
 - the production of the repaired part of a component and of **ANCILLARY** materials
 - use of related energy and water
 - the production and transport aspects and impacts of any wastage of materials during the repair process
- The transportation of the repaired part of component and **ANCILLARY** materials, including aspects and impacts of any wastage of materials during repair-related transportation

- The-end-of-life processes of any **WASTE** from transportation and the repair process, including the part of the component and **ANCILLARY** materials removed

2.1.5.3.1.4 Replacement (Module B4)

The module “Replacement” covers the combination of all technical and associated administrative actions during the service life associated with the return of **CLADDING PRODUCT SYSTEM** to a condition in which it can perform its required functional or technical performance, by replacement of a whole **CLADDING PRODUCT SYSTEM** that has reached the end of its **RSL**. Replacement of a broken component or part due to damage should be included as “Repair”, but replacement of a whole **CLADDING PRODUCT SYSTEM** due to damage should also be considered as “Replacement”. Replacement of a whole **CLADDING PRODUCT SYSTEM** as part of a concerted replacement program for the building should be considered as “Refurbishment”.

The boundary for “Replacement” must include:

- Production of the components and **ANCILLARY** materials used for replacement
- Replacement process, including related water and energy use and the production aspects and impacts of any **WASTE** of materials used during the replacement processes
- Transportation of the components and **ANCILLARY** materials used for replacement, including the aspects and impacts of any **WASTE** of materials during transportation
- End-of-life processes of any **WASTE** from transportation and the replacement processes, including the components and **ANCILLARY** materials removed

The number of replacements of product expected during the **ESL** of the building of 75 years shall be declared. Required or expected maintenance are to be modeled according to manufacturer’s guidelines. Assumptions and key parameters must be clearly stated and the manufacturer is to submit supporting documentation to justify the assumptions made.

If the **REFERENCE SERVICE LIFE (RSL)** of **CLADDING PRODUCT SYSTEMS** is less than the **ESTIMATED SERVICE LIFE (ESL)** of a building in North America, the number of replacements that will be necessary to fulfill the required performance and functionality over the building **ESL** shall be identified. The combined impacts of the original product and any replacements shall be determined by dividing the building **ESTIMATED SERVICE LIFE (ESL)** (75 years) by the **RSL** of the product, and the impacts multiplied by the factor.

Fractional remainders of a replacement cycle shall not be considered across the total impacts of the product's manufacturing, installation, deconstruction, etc.

2.1.5.3.1.5 Refurbishment (Module B5)

The module “refurbishment” covers the combination of all technical and associated administrative actions during the service life of a product associated with the return of a building or other construction works or their parts to a condition in which it can perform its required functions. These activities cover a concerted program of maintenance, repair and/or replacement activity, across a significant part or whole section of the building.

Restoration activities should be included within refurbishment.

The boundary for “Refurbishment” must include:

- Production of the components and **ANCILLARY** materials used for “Refurbishment”
- Refurbishment processes and related water and energy use including production aspects and impacts of any **WASTE** of materials used during the refurbishment processes
- Transportation of the components and **ANCILLARY** materials used for refurbishment, including production aspects and impacts of any **WASTE** during transportation
- End-of-life processes of any wastage from transportation and the refurbishment processes, including the components and **ANCILLARY** materials removed

2.1.5.3.2 B6-B7 Use Stage

2.1.5.3.2.1 Energy use

This module shall not be a part of the **LCA** calculation for the Use Stage for any **CLADDING PRODUCT SYSTEMS** within the scope of this **PCR**.

Cladding products, in most cases, do not directly consume any energy during use. Therefore, passive cladding systems shall not account for direct energy consumption as part of its function. Some cladding products perform an additional role as a thermal insulator, which can reduce the amount of energy needed to heat or cool the occupied space of the building. As a result, the performance of a cladding product system may affect the energy consumed by the HVAC (heating and cooling) system in the building.

2.1.5.3.2.2 Operational water use by building integrated technical systems (Module B7)

This module is not anticipated to be a part of the **LCA** calculation for the Use Stage for any **CLADDING PRODUCT SYSTEMS** within the scope of this **PCR**.

The module B7 includes water use during the operation of the **IBTS**, together with its associated environmental aspects and impacts considering the life cycle of water including production and transportation and **WASTE WATER** treatment [EN 15804, Clause 6.3.4.4.3]. This **PCR** defines that **CLADDING PRODUCT SYSTEMS** have no impact on the operational water use by **IBTS** during the 75 year **ESL** of a building in North America.

2.1.5.4 End-of-Life Stage (Modules C1 through C4)

The end-of-life stage of a **CLADDING PRODUCT SYSTEM** starts when it is removed, dismantled, or deconstructed from the building and does not provide any further function. It can also start at the end-of-life of the building, depending on the choice of the product's end-of-life scenario. The choice of the **WASTE** management methods shall be based on the state of the art and the **WASTE** management methods chosen shall be documented in the Background Report.

During the end-of-life stage of the product or of the building, all output from dismantling, deconstruction or demolition of the building; or of the maintenance, repair, replacement or refurbishing processes; all debris, construction products, materials or products etc. leaving the building, are at first considered as **WASTE**.

This output therefore reaches the end-of-**WASTE** state when it complies with all of the following conditions:

- The material or product reclaimed from the **WASTE** is commonly used for specific purposes.
- A market or demand, identified by a positive economic value, exists for such a reclaimed material or product.
- The reclaimed material or product fulfills the technical requirements for the specific purposes and meets applicable legislation and standards.
The reclaimed material or product shall not lead to overall adverse environmental or human health impacts in use.

When incorporating an End-of-Life scenario, modules C1 through C4 shall be included.

End-of-Life Stage includes:

- C1: Deconstruction, dismantling, or demolition of the product from the building, including initial on-site sorting of the materials
- C2: Transportation of the removed product as part of **WASTE** processing, e.g. to a recycling site, and transportation of **WASTE**, e.g., to final disposal
- C3: **WASTE** processing for reuse, recycling, energy recovery, and/or reclamation.³ **WASTE** processing shall be modeled and the elementary flows shall be included in the inventory.
- C4: **WASTE** disposal including physical pre-treatment and management of the disposal site including provision and transport of all materials, products, and energy and water used during the end-of-life stage.

Environmental loads (e.g., emissions) from **WASTE** disposal in Module C4 are considered part of the **PRODUCT SYSTEM** under review, according to the “polluter pays principle”.

2.1.5.6 Aggregation of INFORMATION MODULES

³ E.g., collection of waste fractions from demolition, and waste processing of material flows intended for reuse, reclamation, and energy recovery.

The indicators declared in the individual **INFORMATION MODULES** of a product life cycle A1 to A3 may be aggregated into a subtotal. Information modules A4 to A5, B1 to B7, and C1 to C4 as described in Figure 1 shall not be aggregated into a total or sub-total of the life cycle stages A, B, C or D but must be reported as separate **INFORMATION MODULES**.

2.1.6 Cut-off Criteria

The following procedure shall be followed for the exclusion of inputs and outputs:

- All inputs and outputs to a **UNIT PROCESS** for which data are available shall be included in the calculation. Data gaps shall be filled by conservative assumptions with average or generic data. Any assumptions concerning such value choices shall be documented.
- In cases of insufficient input data or data gaps for a **UNIT PROCESS**, the cut-off criteria shall be 1% of total primary energy usage and 1% of the total mass input of that **UNIT PROCESS**;
- The total of neglected input and output flows per each group module: A1-A3, A4-A5, B1-B5, B6-B7 and C1-C4 (see Figure 1) shall not exceed a maximum of 5% of energy usage, mass, or environmental impact category indicator covered by this **PCR** (see Table 9).
- Conservative assumptions in combination with plausibility considerations and expert judgments should be used to demonstrate compliance with these criteria.

All hazardous and toxic releases (emissions to air, water and/or land) which are mandatorily monitored and reported to the U.S TRI or Canadian NPRI on yearly basis shall be included in the inventory and the cut-off rules do not apply [ISO 21930]. The exclusion of any such releases shall be governed by the "threshold of significance" of the laws and regulations applicable in the jurisdiction(s) for which the **LCA** is to be valid. The list of included hazardous and toxic releases, and the applied regulations, shall be documented in the Background Report.

Furthermore, the owner of the EPD/LCA has to attest that no threshold of significance has been exceeded for any material the emission of which would otherwise need to be disclosed under applicable laws and regulations.

2.1.7 Data Quality Requirements

Data shall be as current as possible. Data sets used for calculations shall have been updated within the last 10 years for generic data and within the last 5 years for manufacturer-specific primary data.

The specific requirements (e.g. temporal, geographic, and technological quality) and handling of data gaps shall be documented according to ISO 14044. The representativeness of the data used shall be discussed. When data from comparable processes must be used to cover gaps, the technological similarity shall be documented. Handling of data gaps and the use of data models shall be explained.

Data quality requirements shall be treated according to the provisions of ISO 14025 and ISO 14044:2006, Section 4.2.3.6.

2.1.7.1 Period Under Consideration

Primary data sets shall be based on averaged data from 12 consecutive months. The period under consideration for the LCA shall be documented. Deviations shall be justified.

2.1.7.2 Generic Data

As a matter of principle, consistent and equivalent generic data shall be used, such as for background processes to support comparability of results. Data sets taken from databases (i.e., sources that are not specific data from the manufacturer) shall be identified as such in the Background Report, including the source and the year at which the dataset was last updated or pre-verified. The representativeness of the datasets with respect to time, location, and technology shall be documented, and deviations from the actual time, location, and technology relevant to the product shall be disclosed.

2.1.7.3 Transport

Transportation distances and methods shall be documented, as far as they are relevant. In addition, the average hauling distance for the distribution chain in North America (gate to site) can be used.

2.1.7.4 Power Mixes

The following applies in selecting the power mix:

- For the United States, regionally specific inventory data on electricity shall be based on subnational consumption mixes that account for physical power trade between the regions. If such regional data are not available, production mixes of the three continental interconnections (East, West, and Texas) as well as those of Hawaii and Alaska may be used. The sources for electricity and the calculation procedure shall be documented.
- On-site renewable electricity sources, when directly used by a facility to offset grid electricity purchases, may be included in calculations.
- For other regions than the United States, country-specific processes shall be used provided they are representative. For production facilities in several European countries, the applicable power mixes shall be assessed specifically for each country or combined, weighted by production volumes in the respective countries.
- Credits may not be applied to LCA baseline when “green” power certificates are used, but certificates may be reported in Additional Environmental Information. Green power certificates must be available and provided to the **PROGRAM OPERATOR** for the entire period of EPD validity.

2.1.8 Units

Table 2 summarizes the mandatory conversion factors to be used by the **PCR** users.

**Table 2
Mandatory conversion factors**

Convert from (US units)	To (SI units)	Multiply by (3-significant digits)
Pound (lb)	Kilogram (kg)	0.454
British Thermal Unit (BTU)	Joule (J)	1060
Inches (in)	Millimeter (mm)	25.4
Foot (ft)	Meter (m)	0.305
Square foot (ft ²)	Square meter (m ²)	0.0929
Cubic foot (ft ³)	Cubic meter (m ³)	0.0283

Convert from (US units)	To (SI units)	Multiply by (3-significant digits)
Specific density (lb/ft ²)	Specific density (kg/m ²)	4.88
Mile (mi.)	Kilometer (km)	1.61

2.1.9 Inventory Analysis

2.1.9.1 Data Collection

Data collection shall follow the instructions provided in ISO 14044:2006, section 4.3.2.

2.1.9.2 Calculation Procedures

The calculation procedures described in ISO 14044 shall apply. The same calculation procedures shall be applied consistently throughout the **LCA** study. When converting the inputs and outputs of combustible material into energy inputs and outputs, the net calorific value of fuels (Lower Heating Value, LHV) shall be applied according to scientifically based and accepted values specific to the combustible material.

The data collection and calculation procedures shall be documented in the Background Report.

2.1.9.3 Allocation Procedures

For many or most industrial processes more than one input is needed to produce **CLADDING PRODUCT SYSTEM** and sometimes **CLADDING PRODUCT SYSTEMS** are co-produced with other products. As a rule the material flows between them are not distributed in a simple way. When dealing with systems involving multiple products and recycling processes, allocation

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should be avoided as far as possible. Where unavoidable, allocation should be considered carefully and should be justified. The principles for allocation in the PCR are based on the guidance given in ISO 14044:2006, Section 4.3.4.

The chosen allocation approaches shall be clearly documented in the Background Report and consistently applied throughout the **LIFE CYCLE ASSESSMENT**. The principle of modularity shall be maintained. Where processes influence the product's environmental performance during its life cycle, they shall be assigned to the Module in the life cycle where they occur. The sum of the allocated inputs and outputs of a **UNIT PROCESS** shall be equal to the inputs and outputs of the **UNIT PROCESS** before allocation. Double-counting or omission of inputs or outputs through allocation is not permitted.

2.1.9.3.1 Allocation Procedure for CO-PRODUCTS⁴

Where allocation cannot be avoided, allocation procedures should be carried out as follows [based on ISO 14044:2006, Clause 4.3.4.2]:

The study shall identify the processes shared with other **PRODUCT SYSTEMS** and deal with them according to the stepwise procedure presented below.

- a. Wherever possible, allocation should be avoided by:
 - 1) dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes, or
 - 2) expanding the product system to include the additional functions related to the co-products, taking into account the requirements of ISO 14044:2006, Clause 4.2.3.3.

- b. Where allocation cannot be avoided, the inputs and outputs of the system should be partitioned between its different products or functions in a way that reflects the underlying physical relationships between them; i.e. they should reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered by the system. In such a case, any physical parameter, e.g. mass, volume, length, feedstock energy, etc., could be taken into consideration in order to identify the physical parameter

⁴ In industrial processes there may be a wide variety of different types of materials produced in conjunction with the intended product. In business vocabulary, these may be identified as by-products, co-products, intermediate products, non-core products or sub-products. In the PCR these terms are treated as being equivalent. However for the allocation of environmental aspects and impacts a distinction between co-products and products is made in the PCR.

which reflects the underlying physical relationship between product and the other **CO-PRODUCTS**.

c. Where physical relationship alone cannot be established or used as the basis for allocation, the inputs should be allocated between the products and functions in a way that reflects other relationships between them. For example, input and output data might be allocated between **CO-PRODUCTS** in proportion to the economic value of the products.

Some outputs may be partly **CO-PRODUCTS** and partly disposed **WASTE**. In such cases, it is necessary to identify the ratio between **CO-PRODUCTS** and disposed **WASTE** since the inputs and outputs shall be allocated to the **CO-PRODUCTS** part only.

This **PCR** defines “physical allocation”, such as by mass, as the default allocation procedure for the **CLADDING PRODUCT SYSTEMS** in Module A-3.

2.1.9.3.2 Allocation Procedure for Reuse, Recycling, and Recovery

The End-of-Life System Boundary of the product is set where outputs of the system under study have reached the end-of-**WASTE** state. Therefore, **WASTE** processing via reuse, recycling and recovery of the material flows during any module of the **PRODUCT SYSTEM** (e.g., during the Product Stage) is considered to have left the system boundary of that Module. In other words, recycling shall be modelled using the cut-off allocation approach.

2.1.10 Environmental Parameters derived from LCA

In conformance with ISO 21930, this **PCR** covers all required environmental impacts, use of resources, and generation of **WASTE** as specified in Clause 8.2.2, ISO 21930.

2.1.10.1 Parameters Describing Environmental Impacts

Characterization factors from the US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI 2.1 July 2012 impact categories) shall be reported with the exception of GWP, which shall use IPCC AR5. Characterization factors taken from the University of Leiden (CML) methodology are optional additions for EPDs valid in North America.

The following impact assessment indicators shall be calculated and assigned to the **DECLARED** or **FUNCTIONAL UNIT**:

- Global Warming Potential (GWP)
- Ozone Depletion Potential (ODP)
- Acidification Potential (AP)
- Eutrophication Potential (EP)
- Photochemical Ozone / Summer Smog Creation Potential (POCP)

Optionally, information on further environmental impacts, e.g. abiotic resource depletion, ecotoxicity, human toxicity, land use, etc. can be given.

Apart from the results of the impact estimate, the following must also be stated in the Background Report:

- Reference to all characterization models, characterization factors and characterization methods used, such as those defined in Table 3 of this document or the corresponding from according to CML, and
- A statement that the impact-estimate results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

Table 3
Parameters describing environmental impacts

Impact category	Parameter	Unit (per FU or DU)	Source of the characterization method	Level of site specifi- city selected	Environ- mental media
Climate change ¹	Global warming potential, GWP	kg CO ₂ – equiv.	IPCC AR5 2013	Global	Air
Ozone depletion ¹	Depletion potential of the stratospheric ozone layer, ODP	kg CFC-11 equiv.	TRACI 2.1, October 2013/WMO:2003	Global	Air
Acidification ¹	Acidification potential, AP	kg SO ₂ equiv.	TRACI 2.1, October 2013	North America	Air, Water
Eutrophication ¹	Eutrophication potential, EP	kg N equiv.	TRACI 2.1, October 2013	North America	Air, Water
Smog ¹	Smog formation potential, SFP	kg O ₃ equiv.	TRACI 2.1, October 2013, Maximum Incremental Reactivity (MIR).method	North America	Air
Primary Energy, fossil fuel (optional)	Primary energy, fossil fuel	MJ surplus energy ²	TRACI 2.1, October 2013 LCIA methodology ²	Global	Natural resources

Notes:

(1) Required in ISO 21930, Clause 8.2.2.1.

(2) A non site-specific recommendation for fossil fuel use characterization was included within the original version of TRACI (Bare et al. 2003, Goedkoop&Spriensma 1999) and this reference methodology is maintained within the release of TRACI 2.1, October 2013 [U.S EPA 2013].

2.1.10.2 Parameters Describing Resource Use

The following parameters derived from LCI describing resource use may be calculated and assigned to the **DECLARED** or **FUNCTIONAL UNIT** of product.

Table 4
LIFE CYCLE INVENTORY ANALYSIS parameters describing the use of resources

Use of RENEWABLE primary energy excluding the RENEWABLE primary energy used as raw materials	MJ, net calorific value (LHV)
Use of RENEWABLE primary energy resources used as raw materials	MJ, net calorific value
Total use of RENEWABLE primary energy (primary energy and RENEWABLE primary energy resources used as raw materials)	MJ, net calorific value
Use of NON-RENEWABLE primary energy excluding the NON-RENEWABLE primary energy resources used as raw materials	MJ, net calorific value
Use of NON-RENEWABLE primary energy resources use as raw materials	MJ, net calorific value
Total use of NON-RENEWABLE primary energy (primary energy and NON-RENEWABLE primary energy resources used as raw materials)	MJ, net calorific value
Use of SECONDARY MATERIALS	kg
Use of RENEWABLE SECONDARY FUELS	MJ, net calorific value
Use of NON-RENEWABLE SECONDARY FUELS	MJ, net calorific value
Use of fresh water resources	m ³

SECONDARY FUELS are all combustible materials which were recovered from a previous use or from **WASTE** from a previous **PRODUCT SYSTEM** and are used as fuel in a following **PRODUCT SYSTEM**.

2.1.10.3 Other Environmental Information Describing Different WASTE Categories and Output Flows

The following parameters derived from LCI describing different **WASTE** categories and output flows may be calculated and assigned to the **DECLARED** or **FUNCTIONAL UNIT** of product.

Table 5
LIFE CYCLE INVENTORY ANALYSIS parameters describing various WASTE categories

Disposed-of hazardous WASTE	kg
Disposed-of non-hazardous WASTE	kg
Disposed-of radioactive WASTE	kg

Table 6
LIFE CYCLE INVENTORY ANALYSIS parameters describing the output flows

Components for reuse	kg
Materials for recycling	kg
Materials for energy recovery	kg
Exported electrical energy (waste to energy)	MJ, net calorific value per energy carrier
Exported thermal energy (waste to energy)	MJ, net calorific value per energy carrier

The above parameters quantify the material flows once they have both reached the End-of-**WASTE** State and left the System Boundary. The “materials for energy recovery” parameter does not include materials for **WASTE** incineration. **WASTE** incineration is regarded as a **WASTE** processing process and remains within the System Boundary.

2.1.11 Additional Technical and Environmental Information

For technical information, please refer to section 3.2.5 Technical Information

2.1.11.1 CO₂ Certificates

THIRD PARTY-verified CO₂ certificates can be provided in EPDs but not factored into calculated and reported LCA results. EPDs are always valid for a period of 5 years. The **CLADDING PRODUCT SYSTEMS** manufacturer must provide evidence of discontinuation of CO₂ pollution rights in order to claim CO₂ certificates for the entire period of EPD validity or any part thereof. If CO₂ certificates are only provided for one year, either one-fifth can be listed in the annual report or the validity of the certificate is limited to one year and can only be extended unchanged following presentation of the certificates.

2.1.11.2 Other Certificates

Other environmentally relevant product- and manufacturer-specific certificates may be provided in this section such as Forest Stewardship Council (FSC), ISO 14001 certification, and other EHS certifications.

2.1.12 Ownership, Responsibility, and Liability for the EPD

A manufacturer or a group of manufacturers is the sole owner and has liability and responsibility for an EPD.

2.1.13 Verification and Validity of an EPD

After verification an EPD is valid for a 5 year period from the date of issue, after which it shall be reviewed and re-verified. An EPD shall only be reassessed and updated as necessary to reflect changes in technology or other circumstances that could alter the content and accuracy of the declaration. An EPD does not have to be recalculated after 5 years if the environmental performances of **CLADDING PRODUCT SYSTEMS** have not changed significantly.

A significant change in the environmental performance of **CLADDING PRODUCT SYSTEMS** that must be reported to the verifier is $\pm 10\%$ on any one of the total declared parameters of the EPD (see Tables 5-8). Such a change may require an update of the EPD.

The process for verification and establishing the validity of an EPD shall be in accordance with ISO 14025 and ISO 21930.

2.2 Rules for Creating the Background Report

2.2.1 The Content, Format, and Accessibility of the LCA Background Report

The Background Report is a systematic and comprehensive summary of the project documentation based on the rules for completing the **LCA** according to the **PCR** to support the certification of the EPD. The Background Report must be prepared so as to demonstrate to the verifier that the **LCA** prepared according to the information required by this **PCR**, and the EPD document deriving from it, complies with ISO 14025, ISO 14040, ISO 14044, and ISO 21930.

The Background Report shall include all data and information required by the **PCR**. The Background Report must be submitted to the verifier under confidentiality (see ISO 14025). The Background Report is not part of the EPD and will not be made publically available by the verifier.

2.2.2 General Information in the Background Report

The Background Report must contain the following general information:

- Commissioner of the **LCA** study and the organization conducting the **LCA** study,
- Reporting date,
- The reasons for conducting the study,
- The intended application,
- The target group/audience (i.e., is the EPD intended for business-to-business and/or business-to-consumer communication), and
- Evidence that the **LCA** study was completed in accordance with the requirements of these **PRODUCT CATEGORY RULES** with reference to ISO 14040, ISO 14044, ISO 14025 and ISO 21930.

2.2.3 Scope of the study

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2.2.3.1 DECLARED/FUNCTIONAL UNIT

This includes the following:

- Definition of the declared or functional unit
- Relevant technical specification(s)
- Calculation rule for averaging data, when the **DECLARED/FUNCTIONAL UNIT** is defined for:
 - (i) A group of similar products produced by different suppliers; or
 - (ii) The same product produced at different production sites.

2.2.3.2 Description of the System Boundary

The description of the System Boundary, using a modular approach as outlined in Figure 1, includes the following elements:

- An analysis period for each of the modules considered in the **LCA**
- A flow chart showing the energy and material inputs and outputs, taking into consideration how plant-level data are allocated to the **CLADDING PRODUCT SYSTEM(S)**
- Statement of the omissions of life cycle stages, processes, if any
- Assumptions about power generation, including reference year
- Offsetting methods for possible CO₂ certificates
- Assumptions about other background data relevant for describing the System Boundary

2.2.3.3 Explanation of Exclusion of Inputs and Outputs

Exclusions shall not be used in order to hide unfavorable data and shall be governed by the cut-off criteria.

The following procedure shall be followed for the exclusion of inputs and outputs:

- All inputs to and outputs from a **UNIT PROCESS** for which data are readily available shall be included in the calculation. Data gaps may be filled by conservative assumptions of average or generic data following the requirements in Section 2.1.9. Any such assumptions or use of generic data shall be documented in the Background Report.
- In the event of insufficient input data or data gaps for a **UNIT PROCESS**, the cut-off criterion shall be 1% of **RENEWABLE** and **NON-RENEWABLE** primary energy usage or 1%

of the total mass of this **UNIT PROCESS**. The total neglected input flows, e.g. per Module A, B, C or D shall be a maximum of 5% of energy usage or mass.

- Particular care should be taken to include material and energy flows known to have the potential to cause significant emissions into air and water or soil related to the environmental impact indicators of this standard.
- Conservative, plausible assumptions and expert judgement can be used to demonstrate compliance with these criteria, and these and the sources must be given.
- Application of the cut-off criteria shall be documented in the Background Report:
 - Description of the application of cut-off criteria and assumptions, and
 - List of processes not taken into consideration.

2.2.4 Inventory Analysis

The data collection and calculation procedures shall be documented in the Background Report and shall include the following:

- Qualitative/quantitative description of **UNIT PROCESSES** necessary to model the life cycle stages of the **DECLARED UNIT**, taking into account the provisions of ISO 14025 regarding data confidentiality;
- Sources of generic data or literature used to conduct the **LCA**;
- Validation of data, including:
 - (i) Data quality assessment;
 - (ii) Treatment of missing data;
- Allocation principles and procedures, including:
 - (i) Documentation and justification of allocation procedures;
 - (ii) Uniform application of allocation procedures;

2.2.4.1 Description of **UNIT PROCESSES**

Document transparently the modelling of the **UNIT PROCESSES** underlying the **LCA**. This can be done in tabular form or with the help of flow-charts such as screenshots from **LCA** software.

Explain handling of data gaps and models. If several products are declared in one EPD or if one product is produced at several locations, each product or location, and how it's weighted in the final result, should be documented accordingly.

2.2.4.2 Description of Allocation Procedures

Describe allocations made:

- in the use of **SECONDARY MATERIALS** as raw materials
- delineating **CLADDING PRODUCT SYSTEMS** from other products manufactured in the plant
- of multi-input processes if included in the **LCA**
- of reuse, recycling, and energy recovery

The allocation procedure selected must be justified and the allocation procedure used must follow the requirements as described in Section 2.1.9.3, and must be uniformly applied and documented.

2.2.5 LIFE CYCLE IMPACT ASSESSMENT

The Background Report must include:

- the **LCIA** procedures, calculations, and results of the study
- the relationship of the **LCIA** results to the **LCI** results
- reference to all characterization models, characterization factors and characterization methods used
- a statement that the **LCIA** results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks

2.2.6 Interpretation of the Results

Interpret the **LCIA** and the calculated impact indicators for the **DECLARED** or **FUNCTIONAL UNIT**, providing at least:

- Interpretation of the results based on a **DOMINANCE ANALYSIS** of indicators (for the relevant Modules)
- Assumptions and limitations associated with the interpretation of results as declared in an EPD, both methodology and data-related
- The variance from the means of **LCIA** results should be described if generic data are declared from several sources or for a range of similar products
- Data quality assessment
- Full transparency in terms of value choices, rationales, and expert judgements that may have affected the **LCA**.

The influence of assumptions due to data gaps or other uncertainties should be assessed with a sensitivity analysis, as far as the assumptions are relevant to the result.

2.2.7 Documentation of Additional Information

The Background Report shall include any documentation on any additional environmental information declared in an EPD. Such documentation may be supplied as copies to the verifier, for example:

- Laboratory results/measurements for the content declared (i.e. recycled content)
- Laboratory results/measurements of functional/technical performance
- Documentation on declared technical information on individual life cycle stages that have not been considered in the **LCA** of the product and that will be used for the assessment of buildings (e.g., transport distances, cleaning cycles, recycling programs, etc.)
- Laboratory results/measurements for the declaration of emissions to indoor air, soil and water during the product's Use Stage

3.0 Content of the Environmental Product Declaration

The following describes the format and information for creating an EPD for **CLADDING PRODUCT SYSTEMS**.

3.1 Content of the EPD

3.1.1 Summary

The summary must contain the following elements:

- Product name (including product code(s) where applicable)
- Declaration holder: the manufacturer completing the EPD

- Full name, logo, and website of **PROGRAM OPERATOR**
- Declaration number as provided by the **PROGRAM OPERATOR**
- Date of issuance
- End date of validity period (5 years after issuance)
- Reference **PCR** (name, version)
- Signature of the **LCA** and **EPD** verifiers
- Outline of the content in the **EPD**
- **EPD** type shall be declared and shall specify which life-cycle stages are not considered, if the **EPD** is not based on an **LCA** covering all stages
- Explanatory information about the EPD content can be obtained at (<http://www.ul.com/global/eng/pages/offerings/businesses/environment/services/certification/epd/index.jsp>) or send an email to epd@ul.com
- Optional: product image(s)
- The information from Table 7 must be included⁵:

Table 7
THIRD PARTY verification

<p>PCR REVIEW, was conducted by:</p> <p><name and organization of the chairman, and information on how to contact the chairman through the PROGRAM OPERATOR></p>
<p>Independent verification of the declaration and data, according to ISO 14025:2006 and ISO 21930:2007</p> <p>internal external</p>
<p>(Where appropriate) Third-Party verifier:</p> <p><name of the Third-Party verifier></p>

The header must contain the following elements:

- Declaration Holder (i.e. the manufacturer completing the EPD)
- Product name (product number)
- The statement: “according to ISO 14025 and ISO 21930”
- Declaration number
- Date of issuance

⁵ As specified in ISO 14025, Clause 9.4 and ISO 21930, Clause 5.4, third party verification is optional for B to B communication and mandatory for B to C communication.

3.2 Product Description

The **CLADDING PRODUCT SYSTEMS** must be described and description shall contain all the information required in Section 2.1.3, Product Description. The **CLADDING PRODUCT SYSTEMS** shall be described by its technical and functional properties and its application ranges.

The **LCA** can be conducted for either an average product or a specific product. In the case where an **LCA** is calculated as average environmental performance for **CLADDING PRODUCT SYSTEMS** a statement to that effect shall be included in the EPD together with a description of the range of variation of the **LCIA** results. For products produced in multiple locations, the locations of the manufacturer's factories/plants shall be reported in the declaration.

The product description must clearly state if the product is:

- A specific product from a specific factory/plant of a manufacturer
- A specific product as an average from several of the manufacturer's plants
- An average product from a manufacturer's plant
- An average product from several of the manufacturer's plants
- A specific product as an average from several manufacturers' plants
- An average product as an average from several manufacturers' plants

The EPD shall state the geographic regions for which the **LCA** is representative. In the case where an EPD declares an average environmental performance for a number of products a statement to that effect shall be included in the declaration together with a description of the range/ variability of the **LCIA** results if significant.

3.2.1 Product Description

The **CLADDING PRODUCT SYSTEM** must be described. This description includes the condition in which the product is provided to the customer, any installation services, and secondary equipment such as accessories, manuals, etc. must be indicated.

3.2.2 Application

The application for the **CLADDING PRODUCT SYSTEM** must be specified. The applicable standard(s) and/or general technical approval or applicable national regulation(s) must be stated.

3.2.3 Technical Information

The technical information as contained on the manufacturer’s Technical Data Sheet must be provided, with reference to the test standard if applicable, for the **CLADDING PRODUCT SYSTEMS**. Dimensions are to be expressed per **FUNCTIONAL UNIT** or per **DECLARED UNIT**. The following information shall at least be provided, if available, and referenced testing standard provided:

Technical Construction data

Name	Value	Unit
Length		ft
Width		ft
Thickness		in
Density		lb/ft ³
Tensile strength		lbf/in ² (PSI)
Modulus of Elasticity		lbf/in ² (PSI)
U-value of assembly including interruptions to insulation		BTU/(h °F ft ²)
R value of typical materials where continuous		ft ² ·°F·hr/BTU
Water vapor permeance		perm (inch-pound)
Liquid water absorption		% of dry weight
Airborne sound reduction		dB
Sound absorption coefficient		%

3.2.4 Market Placement / Installation Requirements

State the relevant IBC/ANSI standard(s) and/or general technical approval or comparable national regulation. Standards must be quoted as illustrated in the example shown:

- e.g. ANSI/SDI A250.2-2011 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors

3.2.6 Base Materials / Ancillary Materials

The product's material composition given as mass percent to enable the user of the EPD to understand the composition of the product as-delivered. For confidentiality reasons, the declaration of the product formulation is optional for specific product and manufacturer EPDs. Either the product formulation or the MSDS/SDS of the product must be reported, where required by regulation.

3.2.7 Manufacturing

The manufacturing process must be described and can be illustrated using a simple graphic. If the EPD applies for several locations, the production processes for all locations must be described. Quality management systems may optionally be referred to.

3.2.8 Environment and Health Considerations during Manufacturing

Declaration of the environmental pollution abatement equipment installed at the surveyed plants, for example to control particulate matter (PM) emissions, is optional. Any other environmentally friendly practice dealing with emissions to air, water, and soil, or to **WASTE** treatment, may be reported as well. If an Environment Management System is in place it may be referenced here.

3.2.9 Packaging

Describe product-specific packaging: type, composition, and possible reuse of packaging materials (paper, pallets, films, etc.).

3.2.10 Product Installation

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Describe the methods, machinery, tools, **ANCILLARY** materials, dust extraction, noise reduction, etc. to be used during product installation.

3.2.11 Use Considerations

If applicable, describe special features of product for the period of use that have not been discussed elsewhere in the EPD.

3.2.12 Environment and Health Considerations during Use

Information on the relationships between products, the environment, and health; possible content of harmful substances or emissions including radiation. Any recommendations concerning cleaning, maintenance, etc., of the **CLADDING PRODUCT SYSTEM** should be listed in this section.

3.2.13 Reference Service Life

The **RSL** shall only be specified by the manufacturer for “Cradle-to-building- with Use Stage (Option 1)” and “Cradle-to-grave” type of EPDs (see Table 1 and section 2.1.4).

3.2.15 Recycling and Energy Recovery

The possibilities of reuse, recycling, and energy recovery must be described in this section.

3.2.16 Disposal

The possible disposal practices must be indicated.

3.2.17 Additional Information

Optionally, such details as reference source for additional information, e.g., homepage, or reference source for Safety Data Sheet (SDS).

3.3 LIFE CYCLE ASSESSMENT

3.3.1 DECLARED UNIT / FUNCTIONAL UNIT

State either the **DECLARED UNIT** or **FUNCTIONAL UNIT** as described in Section 2.1.2, as appropriate for the selected EPD type. The section is also to include a description of the grade of the product and, if applicable, it's **RSL**.

3.3.2 System Boundary

Describe the System Boundary as required in Section 2.1.5.

3.3.3 Estimates and Assumptions

Describe in this section of the EPD the key assumptions and estimates for interpretation of the LCA.

3.3.4 Cut-off Criteria

Document the use of cut-off limits as per Section 2.1.6 here.

3.3.5 Background Data

Provide the sources for background data used, as described in Section 2.1.9

3.3.6 Data Quality

Include a summary of the data quality requirements as documented in the Background Report described in Section 2.1.7.

3.3.7 Period Under Consideration

Use average values over a period of twelve consecutive months of the quantities of raw materials, energies, **ANCILLARY** materials, and supplies used by the producing plants. Document any deviations from the 12 month period in this section.

3.3.8 Allocation

Justify, describe, and document the allocation procedure, if any, and its uniform application.

3.3.9 LCA Results

In Table 9, Part A, "Description of the System Boundary" below, all declared Modules shall be indicated with an "X"; all Modules that are not declared shall be indicated with "MND". In Table 9 Part B, C and D columns may be deleted for Modules that are not declared. Indicator values should be declared with two significant digits in exponential form (e.g. 1.2E-5 = 0.000012). A uniform format should be used for all values of one indicator. If several Modules are not declared and therefore have been deleted from the table, the abbreviations for the indicators can be replaced by the complete names. The **RSL** for modules B1 through B7 must correspond with the grade of the product as stated in section 3.3.1.

Report results based on characterization factors from the US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI 2.1 impact categories). Impact categories taken from the University of Leiden (CML) methodology are optional and shall only be reported for EPDs used outside of North America.

**Table 9
LCA results**

Part A- Description of the system boundary (X: included in LCA; MND- module not declared)				
Product	Construction Installation	Use	End-of-life	Benefits of loads beyond the system boundary

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Raw Material Extraction and Processing	Transport	Manufacturing	Transport	Construction/ Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-Construction/ Demolition	Transport	WASTE Processing	Disposal	Reuse	Recovery	Recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
X	X	X	X	X		MND	MND	MND	MND	MND		MND	MND	MND	MND			

Part B- LIFE CYCLE IMPACT ASSESSMENT Results

DECLARED UNIT or FUNCTIONAL UNIT: [Insert DECLARED UNIT]

Part B.1 Impact Assessment Methodology: TRACI 2.1		Modules included in LCA: (to be reported below)	UNITS
GWP	Global warming potential		kg CO ₂ Eq.
ODP	Depletion potential of the stratospheric ozone layer		kg CFC 11 Eq.
AP	Acidification potential		kg SO ₂ Eq.
EP	Eutrophication potential		kg N Eq.
POCP	Photochemical ozone creation potential		kg O ₃ Eq.
ADPF (optional)	Abiotic depletion potential for fossil resources		MJ surplus energy
Part B.2- Impact Assessment Methodology: CML (optional)		Modules included in LCA: (to be reported below)	UNITS
GWP	Global Warming Potential		kg CO ₂ Eq.
ODP	Depletion potential of stratospheric ozone layer		kg CFC-11 Eq.
AP	Acidification potential		kg SO ₂ Eq.
EP	Eutrophication potential		kg (PO ₄) ³⁻ Eq.
POCP	Photochemical ozone creation potential		kg ethane Eq.



PRODUCT CATEGORY RULE

CLADDING SYSTEM PRODUCTS

According to ISO 14025 and ISO 21930

ADPE	Abiotic depletion potential for non-fossil resources		kg Sb Eq.
ADPF	Abiotic depletion potential for fossil resources		MJ surplus energy
Part C- Resource Use (optional)		Modules included in LCA: (to be reported below)	UNITs
PERE	Use of RENEWABLE primary energy excluding the RENEWABLE primary energy used as raw materials		MJ (LHV)
PERM	Use of RENEWABLE primary energy resources used as raw materials		MJ
PERT	Total use of RENEWABLE primary energy (primary energy and RENEWABLE primary energy resources used as raw materials)		MJ
PENRE	Use of NON-RENEWABLE primary energy excluding the NON-RENEWABLE primary energy resources used as raw materials		MJ
PENRM	Use of NON-RENEWABLE primary energy resources use as raw materials		MJ
PENRM	Total use of NON-RENEWABLE primary energy (primary energy and NON-RENEWABLE primary energy resources used as raw materials)		MJ
SM	Use of SECONDARY MATERIALS		kg
RSF	Use of RENEWABLE SECONDARY FUELS		MJ
NRSF	Use of NON-RENEWABLE SECONDARY FUELS		MJ
FW	Use of FRESH WATER resources		m ³
Part D- Output Flows and WASTE Categories (optional)		Modules included in LCA: (to be reported below)	UNITs
HWD	Disposed-of-hazardous WASTE		kg
NHWD	Disposed-of non-hazardous WASTE		kg

PRODUCT CATEGORY RULE

CLADDING SYSTEM PRODUCTS

According to ISO 14025 and ISO 21930

RWD	Disposed-of Radioactive WASTE		kg
CRU	Components for reuse		kg
MFR	Materials for recycling		kg
MET	Materials for energy recovery		kg
EEE	Exported electrical energy (waste to energy)		MJ
EET	Exported thermal energy (waste to energy)		MJ

3.3.9.1 Comparability of EPDs

EPDs must not contain statements of the superiority of one product over a competitor's product that performs the same functions, or of one manufacturer against another. **CLADDING PRODUCT SYSTEMS EPDs** must not contain directly or indirectly such **COMPARATIVE ASSERTIONS**.

The following ISO statements indicate the EPD comparability limitations and intent to avoid any market distortions or misinterpretation of EPDs based on this **CLADDING PRODUCT SYSTEMS PCR**.

ISO 14025 requires this statement be included: "Environmental declarations from different programs may not be comparable".

In conformance with ISO 21930, Clause 5.6, a statement shall be included that indicates, "comparison of the environmental performance of **CLADDING PRODUCT SYSTEMS** using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under this PCR".

This statement must be included: "Full conformance with the **PCR** for North American **CLADDING PRODUCT SYSTEMS** allows EPD comparability only when all stages of a **CLADDING PRODUCT SYSTEM'S** life cycle have been considered. However, variations and deviations are possible". Example of variations: Different **LCA** software may lead to differences in **LCI** data quality upstream or downstream of the Stages declared.

The EPD owner shall transparently indicate any comparability limitations here. For example, any deviation from the **PCR** requirements must be stated.

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3.3.10 LIFE CYCLE ASSESSMENT Interpretation

To facilitate comprehension of the **LCA**, both the aggregate indicators of the **LCI** and the estimated impact outlined in Section 5 “**LCA results**” must be interpreted. This interpretation must also include a description of the time frame and/or variation of the **LCIA** results if the EPD is for several products. An illustration of the results with figures is recommended. For example, the **DOMINANCE ANALYSIS** or the distribution of impacts across the Modules, or others should be provided, as appropriate for a reader's understanding of the environmental profile of **CLADDING PRODUCT SYSTEMS**.

3.3.11 Other Required Evidence

As a general rule, all statements must be documented with measured data and supported by the corresponding test certificates. In the case of substances which are declared “not detectable”, the limit of detection must be stated. The methods of evidence and the test conditions are to be indicated. Interpreting statements such as “... free of ...” or “... are entirely harmless ...” are not permissible. If evidence is not provided the reasons are to be indicated in the EPD.

3.4 LCA Scenarios and Additional Technical Information

Table 10 LCA scenarios and additional technical information (optional)

A4 module- Construction stage - Transport to the Building Site	Value	Dimensions
Fuel type and consumption of vehicle or vehicle type used for transport; e.g., long distance truck, ship, etc.		Liter of fuel type per distance or vehicle type
Transport Distance		km
Capacity utilization (including empty runs)		%
Bulk density of transported products		kg/m ³
Volume capacity utilization factor (factor: =1 or <1 or 1 for compressed or nested packaged products)		-
A4 module- Construction stage - Installation into the Building	Value	Dimensions

ANCILLARY materials for installation (specified by material)		kg and dimensions as appropriate
WATER CONSUMPTION		m ³
Other resources		kg
Quantitative description of energy type (regional mix) and consumption during the installation process		kWh or MJ
WASTE materials on the building site before WASTE processing, generated by the product's installation (specified by type)		kg
Output materials (specified by type) as result of WASTE processing at the building site; e.g., of collection for recycling, for energy recovery, disposal (specified by route)		kg
Direct emissions to ambient air, soil and water		kg
Use Stage	Value	Dimensions
<i>B1 module- Use of the installed product</i> <i>Information on B1 is covered under Section 2.5.1.3.1</i>		
<i>B2 module- Use Stage- Maintenance</i>		
Maintenance process	Description or source where description can be found	
Maintenance cycle (e.g., number of battery changes and batteries per RSL)		number per RSL , or interval
Net WATER CONSUMPTION during maintenance		m ³
ANCILLARY materials for maintenance; e.g., cleaning agent, specify materials		kg/cycle
Energy input during maintenance; e.g., vacuum cleaning, energy carrier type, e.g. electricity; and amount		kWh or MJ
WASTE material resulting from maintenance (specify materials)		kg

PRODUCT CATEGORY RULE

CLADDING SYSTEM PRODUCTS

According to ISO 14025 and ISO 21930

<i>B3 module- Use stage- Repair</i>		
Repair process		Description or source where description can be found
Inspection process		Description or source where description can be found
Repair cycle		number per RSL , or interval
WATER CONSUMPTION		m ³
ANCILLARY materials, e.g., lubricant; specify materials		Kg
Energy input during repair, e.g., energy carrier type, , welding gases, and amount		kWh
WASTE material resulting from repair, (specify materials)		Kg
<i>B4/B5 module- Use stage- Replacement/Refurbishment</i>		
Replacement cycle		number per RSL , or interval
Energy input during replacement e.g. energy carrier type, e.g., electricity, welding gases; and amount, if applicable and significant		kWh
Exchange of worn parts during the product's life cycle, e.g., zinc galvanized steel sheet. Specify materials		Kg
<i>B6 and B7 module- Use stage-Operational Energy and Water Use (Building ESL= 75 years)</i>		
	Value	Dimensions
ANCILLARY materials specified by material		kg or dimensions as appropriate
Net WATER CONSUMPTION		m ³
Type of energy carrier, e.g., electricity, natural gas, district heating		kWh
Power output of equipment		kW
Characteristic performance, e.g., energy efficiency, emissions, variation of performance with capacity utilization, etc.		dimensions as appropriate

PRODUCT CATEGORY RULE

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According to ISO 14025 and ISO 21930

Further assumptions for scenario development, e.g., frequency and period of use, number of occupants		dimensions as appropriate
C1-C4 module- End-of-Life	Value	Dimensions
WASTE collected separately		kg
WASTE collected with mixed construction WASTE		kg
Material sent to Reuse		kg
Material sent to Recycling		kg
Material sent to Energy Recovery		kg
Material sent to Landfilling		kg

3.5 References

The literature referred to in the EPD must be cited in full. Standards relating to evidence and/or technical features already fully quoted in the EPD do not need to be listed here.

3.6 Verification

The verification of the EPD shall record that the **LCA**-based information and the additional information as declared in the EPD meet the requirements of ISO 14025 and ISO 21930.

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