



Product Category Rules for Building-Related Products and Services in:

Brazil
China
Europe
India

Japan
Korea
North America
South East Asia

Part A: Life Cycle Assessment Calculation Rules and Report Requirements

UL Environment

Standard 10010

Version 4.0

www.ul.com/businesses/environment

UL Verification Services, Inc.
333 Pfingsten Road
Northbrook, Illinois 60062

Version tracking

Ver- sion	Comments	Date
1.0	Implemented EN 15804 in the IBU range regulations. This document replaces the previous "General Principles" (valid as at 20.01.2006).	27.09.2011
1.1	Adapting the standard quotations in accordance with the latest version of EN 15804.	20.09.2012
1.2	Additional texts and decisions by the SVA (from 22.03.2013) implemented.	03.04.2013
1.3	Revision to harmonize and regionalize to North American applicability under mutual recognition program with UL Environment	19.06.2014
2.0	Update to incorporate more stringent project report and EPD reporting requirements in collaboration with USGBC with input from a Technical Advisory Panel	16.3.2017
3.0	Updated to conform with ISO 21930:2017 and expanded scope to include Brazil, China, India, Japan, Korea, and South East Asian markets	06.11.2017
3.1	Updated to reference Sections of ISO 21930 and incorporate content previously in sub-category Part B PCRs	05.02.2018
3.2	Updated to reconcile differences in ISO 21930:2017 and EN 15804:A1 via panel review	12.07.2018
4.0	Updated to provide conformance pathway with EN 15804:A2	28.03.2022

© UL Verification Services

Any type of reproduction, including excerpts thereof, shall require the approval of the publisher.

Acknowledgements

Technical Advisory Panel members reviewed and provided feedback on content written by UL and the US Green Building Council (USGBC). Past and present members of the Technical Advisory Panel include the following individuals:

PAST MEMBERS

Sarah Buffaloe, USGBC
Sara Cederberg, USGBC
Paul Firth, UL
Tom Gloria, Industrial Ecology Consultants
David Green, BASF
Wes Ingwersen, EPA
Christoph Koffler, thinkstep
Keith Lindemulder, Nucor
Lise Laurin, Earthshift Global
David Marcus, USGBC
Anna Lasso, UL Environment
Brenden Owens, USGBC
Eva Schmincke, thinkstep
Kate Simonen, University of Washington
Wayne Trusty, Independent Consultant

Per the ISO 14025 requirements, this Part A was reviewed by the following critical review panel:

Lindita Bushi, PhD, Chair
Athena Sustainable Materials Institute
lindita.bushi@athenasmi.org

Hugues Imbeault-Tétreault, Eng., M.A.Sc.
Groupe AGÉCO
hugues.i-tetreault@groupeageco.ca

Jack Geibig
Ecoform
jgeibig@ecoform.com

Product Category Rules (PCR) Guidance for Building Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL 10010

Sixth Edition, Dated March 28, 2022

Summary of Topics:

Product Category Rules (PCR) Guidance for Building Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL 10010 Version 4.0 has been issued.

Subject to these terms and conditions and those in any other agreements between you and UL Environment, Underwriters Laboratories Inc. (UL) and/or their representatives, you are hereby granted a limited, non-exclusive, non-transferable license to use the Product Category Rules (PCR) solely for your internal, non-commercial business purposes. The PCR is not being sold, and other than the limited license

granted herein UL retains all rights, title and interest (including exclusive ownership) in the PCR and all copyright therein. UL reserves the right to regain possession of the PCR from you at any time. When no longer needed, you agree to destroy the PCR (if in hardcopy form) or delete and purge the PCR from your files (if in electronic form). No part of the PCR may be reproduced, modified, stored in a retrieval system, or transmitted in any form by any means, whether electronic, mechanical photocopying, recording, or otherwise without prior written permission of UL or UL Environment. You further agree not to create any derivative works from the PCR or remove or alter any copyright or other proprietary notices in the PCR. The limited license to use the standard shall automatically terminate upon your breach of any of the terms and conditions herein or any other agreement between you and UL, UL Environment and/or their representatives.

UL Environment provides this PCR "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL Environment, UL or any of their affiliates be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this PCR, even if UL Environment or UL or their authorized representative has been advised of the possibility of such damage. In no event shall UL Environment's or UL's liability for any damage ever exceed the price paid for the license to use this PCR, regardless of the form of the claim.

Users of the electronic versions of UL Environment's Product Category Rules agree to defend, indemnify, and hold UL Environment, ULI, their affiliates and each of their respective trustees, officers, employees, agents and representatives harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic PCR on the purchaser's computer system.

TABLE OF CONTENTS

1	Background	6
2	LCA Project Report Content, Structure, and Accessibility.....	6
2.1	General Information	7
2.2	Study Goal	7
2.3	Methodological Framework	7
2.4	Declared/Functional Unit.....	7
2.5	Product Averages for EPDs	8
2.5.1	Industry Average EPD	8
2.5.2	Manufacturer Specific EPD	8
2.6	Product Description.....	9
2.7	Product Application	9
2.8	System Boundaries.....	9
2.8.1	Types of EPDs.....	10
2.8.2	Reference Service Life and Building Estimated Service Life	10
2.8.3	System Boundary with Nature and Between Product Systems.....	11
2.8.4	System Boundaries and Scenarios	11
2.8.5	Disposal Pathways by Region.....	17
2.8.6	Waste Classification by Region.....	20
2.8.7	Incineration Efficiency	20
2.8.8	Power Mix.....	22
2.8.9	Renewable Energy Certificates and Offsets	22
2.9	Cut-Off Rules	23
3	Life Cycle Inventory Analysis	23
3.1	Data Selection, Collection, and Data Quality.....	23
3.1.1	Data Quality Evaluation.....	25
3.1.2	Background Data	26
3.2	Calculation Procedures	27
3.3	Allocation	27
3.3.1	Allocation Between Product Systems (Across the System Boundary)	27
3.3.2	Description of Allocation Processes in the Project Report	29
3.4	Description of the Unit Processes in the Project Report	29
4	Life Cycle Inventory and Impact Assessment Results	29
4.1	Life Cycle Inventory Indicators per ISO 21930	30
4.1.1	Freshwater Consumption	31
4.1.2	Waste Categories and Output Flows.....	31
4.2	Accounting for Biogenic Carbon Content, Uptake and Emissions	32
4.3	Accounting for Calcination and Carbonation	32
4.4	Accounting of Delayed Emissions	32



4.5	Greenhouse Gas Emissions from Land-Use Change	33
4.6	Carbon Emissions and Uptake	33
4.7	Life Cycle Impact Assessment Indicators for North America	34
4.8	Life Cycle Impact Assessment Indicators For Europe	35
4.9	International Life Cycle Impact Assessment Indicators	35
4.10	Optional LCIA indicators and other additional environmental information	36
4.11	Mandatory Environmental Information.....	36
4.11.1	Regulated Hazardous Substances.....	36
4.11.2	Dangerous Substances.....	36
4.12	Units	37
5	Life Cycle Interpretation.....	37
6	Documentation of Additional Information	37
6.1	Laboratory Results and Scenario-Related Information	37
6.2	Documentation for Calculating the Reference Service Life (RSL)	38
6.3	Data Available for Verification	38
7	EPD Reporting Requirements.....	39
7.1	Declaration of General Information	39
7.2	Declaration of Methodological Framework	41
7.3	Declaration of Technical Information and Scenarios	41
7.4	Declaration of Environmental Parameters Derived From LCA.....	41
7.5	Declaration of Additional Environmental Information	41
7.6	References	42
8	Further EPD Requirements	42
8.1	EPD Ownership, Liability and Responsibility	42
8.2	Content of EPD	42
8.3	Verification	42
8.4	Validity	42
8.5	Comparability.....	42
9	Pre-Verified Tools for EPD Development.....	43
10	Comparability and Benchmarking of EPDs	43
10.1	Benchmarking in EPDs	43
10.2	Industry-Average Benchmarking	43
10.3	Product-Specific Benchmarking	45
11	Digitized EPDs	46
12	References.....	46
	Annex A. Additional requirements for conformance with EN 15804+A2.....	47

1 BACKGROUND

This document is a core PCR standard for construction works-related products and services and is meant to be used with product- and service-specific, sub-category Part B PCR documents by any Program Operator. Part B PCR documents that reference this Part A may be developed by any Environmental Product Declaration (EPD) Program Operator.

This document specifies the calculation rules and reporting requirements for the underlying Life Cycle Assessment (LCA) reports used to inform EPDs in accordance with ISO 21930 or EN 15804 if conformance with the latter standard is sought. An LCA project report must be submitted for each EPD registered.

Due to inherent standard compatibility issues, this PCR shall be used with either ISO 21930:2017 or EN 15804:2012+A2:2019; conformance is only possible with one standard. For example, if conformance with EN 15804:2012+A2:2019 is sought, conformance with ISO 21930: 2017 is forfeited. See Annex A for additional requirements for EPD conformance with EN 15804+A2.

This document cites the ISO 21930:2017 standard in many sections and EN 15804:2012+A2:2019 standard in Annex A. Certain clauses of these standards' text have been omitted for reasons of readability, however not with the intention to compromise the conformity of this document with ISO 21930 and EN 15804. Those clauses are marked as [...].

Whenever 'justification' is required in this text, it is intended to be included in the LCA report unless otherwise stated.

The core governing standards for this Part A are ISO 14040, 14044, 14025, 21930, or EN 15804. This PCR may not be used to produce an EPD without the use of a Part B, or subcategory PCR.

2 LCA PROJECT REPORT CONTENT, STRUCTURE, AND ACCESSIBILITY

The LCA project report represents the systematic and comprehensive summary of project documentation that supports the verification of an EPD. The project report must document any data and information of importance to the results published in the EPD and as required by this document. An LCA project report for an EPD must follow the calculation rules and reporting requirements for the underlying LCA reports as specified in this Part A.

The project report must support that the LCA-based information and the additional information as declared in the EPD meet the requirements of this Part A. Particular care shall be given to provide comprehensive explanations regarding how the information declared in the EPD arises from the LCA and how – if declared – the reference service life (RSL) was established.

The structure of the project report shall follow the structure of this standard based on ISO 21930 or EN 15804 if conformance with the latter standard is sought. See ISO 21930 Section 10 for detailed requirements of the project report.

The project report must be accessible to the verifier under the conditions of confidentiality (see ISO 14025, 8.1.4 and 8.3 and ISO 21930, 10.1 and 10.3).

In conformance with ISO 21930, Section 10.2, the results, data, methods, assumptions, limitations and conclusions of the project report shall be completely and accurately reported without bias. All elements of the project report shall be reported in a transparent manner with enough detail to allow independent verification and permit an understanding of the



complexities and trade-offs inherent in the LCA. The report should also allow the results and interpretation to be used in support of the data and additional information made available in the respective EPD.

The project report is not part of the public communication.

2.1 GENERAL INFORMATION

The project report must contain the following general information:

- ▶ The client commissioning the Life Cycle Assessment, internal or external Life Cycle analysts
- ▶ The report date
- ▶ Indications that the Life Cycle Assessment was performed in agreement with the requirements of these Product Category Rules with reference to ISO 21930 or EN 15804, if conformance with the latter standard is sought.

Any Part B PCR which is based on this Part A standard must include all unchanged elements of this Part A PCR according to ISO 21930 Section 6.1. In the case that any requirements in the specified elements conflict between Part A and Part B, Part A shall be followed.

Sub-category Part B PCRs based on this Part A standard must either include: a) the same structure and text as ISO 21930 along with additional elements and specifications for the product sub-category, or b) only the headings from and references to ISO 21930 with additional elements and specifications for the product sub-category.

The UNSPSC code and the appropriate Construction Specifications Institute (CSI) / Construction Specifications Canadian (CSC) classification shall be identified for the product category covered by the Part B PCR.

2.2 STUDY GOAL

The study goal must be outlined in the project report, including the following:

- ▶ Reasons for performing the study
- ▶ Intended use
- ▶ Target group, i.e. whether the information and data for an EPD is intended for business-to-business (B2B) and/or business-to-consumer (B2C) communication.

[ISO 21930, Section 5.4]: “The environmental information on construction products is intended mainly for B2B communication and its prime purpose is to provide measurable and verifiable input for the assessment and improvements of the environmental performance of construction works. However, some EPDs may be used in the B2C marketplace and, when doing so, the user of this document shall follow the provisions of ISO 14025:2006, Clause 9.” ©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

2.3 METHODOLOGICAL FRAMEWORK

The LCA shall follow an attributional approach as outlined in ISO 21930 Section 7.1.1.

2.4 DECLARED/FUNCTIONAL UNIT

The LCA of the construction product must be calculated for a declared or functional unit as specified in the relevant sub-category Part B PCR for the product group, in conformance with ISO 21930 Section 7.1.2 and 7.1.3. The selected declared or functional unit must be documented in the project report. In addition, a mass conversion factor of the declared or functional unit shall be provided, where appropriate.

2.5 PRODUCT AVERAGES FOR EPDS

Averaging of products may significantly reduce EPD development efforts by allowing manufacturers to use one LCA for multiple products and should be considered during the PCR development. Two types of product averages are allowed using this PCR; industry average EPDs and manufacturer-specific averages.

The range of products included in an EPD shall be justified in the context of EPD application; i.e. what the EPD represents, according to ISO 21930 section 5.3. It is crucial that the reasoning be explained and the average reported value can be understood. For example, if a single product is made using a single process, but contains variance of recycled content (different for different locations), an EPD can represent the product as an average of the virgin and recycled material content given the rationale is fully explained. An average is also appropriate in the case of products demonstrating a wide range of variation based on selection of materials serving the same function, such as choice of upholstery fabric on a seat chair cushion.

Further guidance and clarification for calculating and reporting product averages may be provided by the relevant Part B PCR and shall be followed.

2.5.1 INDUSTRY AVERAGE EPD

The method for creating an industry-average EPD shall be described. To ensure an industry-average EPD is representative, the information provided in the average EPD and in the LCA report shall be presented according to ISO 21930 Section 5.3.

Note: Include how a sufficient statistical representation is achieved, how geographic location is assessed, and how the average is weighted to insure sufficient representation so as to avoid bias. A quantitative assessment of primary dataset variability, including mean, median, standard deviation, and best fitting probability distribution function shall be included.

In cases where industry associations decide, for disclosed or undisclosed reasons, to not make publicly available a quantitative assessment of primary dataset variability, including mean, median, standard deviation, and best fitting probability distribution function, sensitivity and scenario analysis shall be conducted. Additional requirements and/or recommendations may be provided in the sub-category Part B PCR.

The method of dataset averaging shall be described (i.e., horizontal or vertical averaging) and justified. The justification shall consider if data is more appropriately represented by standalone gate-to-gate processes (horizontal averaging) versus capturing the flow of goods within a facility(ies) (vertical averaging).

A qualitative assessment shall be provided within the EPD that estimates percent representation of industry and percent geographical region representation, the median reference flow units (e.g. weight, area, volume), and other contributing sources of variation (e.g. operational capacity, grid mix). Per ISO 21930 Section 5.3, a sensitivity analysis should be conducted on the differences between the products included the average.

2.5.2 MANUFACTURER SPECIFIC EPD

The method for creating a company specific individual product/product group EPD shall be described according to ISO 21930, section 5.3, including the method for determining a weighted average across products based on production volume. If a product is manufactured at different production sites, the sites shall be indicated and method for determining the weighted average shall also be described.



Note: Products of similar specifications, and utilized for the same application(s) may be grouped and reported as an average declared product in the same EPD provided that 1) the products included in the grouping differ by no more than $\pm 10\%$ for any environmental impact indicator and 2) the weighted coefficient of variation across all products shall be less than or equal to 20% for any impact category with the exception of Ozone Depletion Potential (ODP). If the weighted coefficient of variation is 20% or greater for any impact category with the exception of ODP, each product shall be shown separately. Quantitative justification should be provided in the LCA that substantiates the reported average declared product.

2.6 PRODUCT DESCRIPTION

The declared product must be described with regards to its technical and functional specifications.

[ISO 21930, Section 6.3]: “The product group covered by a sub-category Part B PCR shall be described unambiguously.

The definition may consider product functionality (e.g. conveyance of materials through pipes), typical production processes (e.g. mining or oil refinery) or applications (e.g. for use in cold climates).

If there is potential ambiguity in the product sub-category, the description shall also state which products are not covered by the sub-category Part B PCR.”

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

2.7 PRODUCT APPLICATION

The designated application(s) for the referenced product(s) shall be specified/described.

2.8 SYSTEM BOUNDARIES

The system boundaries of the LCA and EPD shall follow the modular structure in line with ISO 21930 Section 5.2.1. This PCR encourages, when possible, EPDs that are cradle to grave in scope (Modules A1-C4) but also recognizes EPDs that are cradle to gate (Modules A1-A3) and cradle to gate with optional modules as being in scope.

The environmental information of an EPD shall be subdivided into four life cycle stages per Figure 1: Production (Modules A1-A3); Construction (Modules A4-A5); Use (Modules B1-B7); and EOL (Modules C1-C4). Only the declaration of the Production modules, A1-A3, is required for conformance with ISO 21930. The declaration of other life cycle modules is optional, unless specifically addressed in a sub-category Part B, with the exception of Module C (see Section 2.8.4.5). Module D is not a life cycle stage like the life cycle stages assessed in information modules A1 to C4. Module D is outside the system boundary of the studied product system and construction works system.

Any omissions of life cycle stages, processes or data shall be documented and justified in the LCA and EPD.

Figure 1. Common four life cycle stages and their information modules for construction products and construction works and the optional supplementary module D

(adapted from Figure 2, ISO 21930)

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

* Modules B2 – B5 include production, transport and disposal of necessary materials

** Module B4 is not applicable at the product level

For construction products requiring activity or use of energy and/or water during the use stage, technical information for the relevant information modules (B2 to B5 or B6 and/or B7, respectively) is required per ISO 21930, Section 5.2.1.

When a product EPD only includes Module A (Production stage), the following information regarding intended use of the product shall be provided as additional information:

- ▶ Other products not included in assessment needed for product to serve intended function in the construction work
- ▶ Anticipated replacement cycle of product in the construction work context
- ▶ Intended use

Supplementary environmental information may also be provided in module D that addresses potential loads and benefits beyond the product system boundary.

2.8.1 TYPES OF EPDs

Per ISO 21930, Section 5.2.2 “The LCA-based information in an EPD may cover different combinations of information modules, i.e. cover different life cycle stages or parts thereof. There are three types of EPDs: “cradle to gate”, “cradle to gate with options” and “cradle to grave”. See Figure 1 for the information modules included in each type of EPD.

The sub-category Part B PCR shall state the type of EPDs allowed according to the definitions provided in ISO 21930, Section 5.2.2, and shall also include the required scenarios according to ISO 21930, Section 7.1.7.

It may also contain only the relevant technical information for further calculation of the environmental performance in the scenarios.

2.8.2 REFERENCE SERVICE LIFE AND BUILDING ESTIMATED SERVICE LIFE

The indication of the RSL is required for EPDs covering the complete use stage (modules B1-B7), or if a use stage scenario is described, which refers to the lifetime of the product. If no



use stage modules are declared, and no use stage scenario which refers to the lifetime of the product is described, the indication of the RSL is voluntary. Refer to ISO 21930 Section 7.1.4 for more information.

The RSL information to be declared in an EPD covering the use stage shall be provided by the manufacturer. If primary data to support declaration are unavailable, a default RSL of 75 years may be assumed for the product category system (if applicable; described as part of the functional unit or reported under additional environmental information, if all life cycle stages are not declared) unless the sub-category Part B PCR indicates otherwise, or if otherwise stated and substantiated. When reporting the number of replacements necessary to fulfil the required performance and functionality over the construction works Estimated Service Life (ESL), fractional values shall be rounded up to the nearest tenth. An assumed ESL of 75 years shall be used for the construction works life.

The RSL shall refer to the declared technical and functional performance of the product. A standard life expectancy based on the prescribed method or default of 75 years shall be used, with the option of any deviation allowed only if justified in writing, publicly available for review, and posted for publication. When reported, the RSL shall be established in line with all of the specific rules in North American (NA) product standards and shall also consider, but not necessarily adhere to, the ISO 15686-1, -2, -7 and -8 standards. Where information is available for deriving the RSL from NA product standards, such data has priority. This PCR acknowledges product manufacturers cannot be held responsible for the actual design of the construction works, use and application of the product, environment, or workmanship.

The assumptions upon which the designated RSL is based and for which the RSL exclusively applies shall be provided in project report. Influences on ageing, when applied, shall be in accordance with the state of the art.

2.8.3 SYSTEM BOUNDARY WITH NATURE AND BETWEEN PRODUCT SYSTEMS

System boundaries with nature and between product systems shall be defined, calculated and reported according to ISO 21930 Sections 7.1.5 and 7.1.6.

2.8.4 SYSTEM BOUNDARIES AND SCENARIOS

[ISO 21930, Section 7.1.7.1]: “The information modules A1, A2 and A3 are based on the actual and representative data of the production process of the product. However, as soon as a construction product leaves the factory gate, the assessment shall be based on scenarios and assumptions. The scenarios and assumptions considered depend upon various details including location, type of transport, method of installation and construction, type of construction works, use, maintenance and repair, end-of-life treatment and waste handling.”

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

Specific requirements for scenarios and assumptions shall follow ISO 21930 Section 7.1.7.1, and additional requirements may be provided in the sub-category Part B PCR.

[ISO 21930, Section 7.1.7.1]: “Within an EPD, the indicators declared in the individual information modules of a product life cycle (i.e. A1 to A5, B1 to B7, C1 to C4) and the optional supplementary information beyond the life cycle (module D) shall not be aggregated in any combination of the individual information modules into a total or subtotal of the life cycle stages. As an exception, individual indicators for information modules A1, A2 and A3 may be aggregated to a total for each indicator in the production stage.”

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

Scenarios shall be provided only for the environmental assessment. A scenario shall be based on relevant technical information. With the help of the scenario, the predetermined parameters of the EPD are derived by applying the calculation rules given in this standard.

A scenario shall be realistic and representative of one of the most probable alternatives. (If there are, e.g. three different applications, the most representative one, or all three scenarios shall be declared). Scenarios shall not include processes or procedures that are not in current use or which have not been demonstrated to be practical.

EXAMPLE 1: A recycling system is not practical if it includes a reference to a return system for which the logistics have not been established.

EXAMPLE 2: Energy recovery needs to be based on existing technology and current practice.

For EPDs that declare optional information modules, the additional technical information related to the scenarios underlying these modules is required.”

If an optional module is declared, the relevant technical information, e.g. recycling or reuse rates, shall be documented in the project report with reference to the respective literary source.

2.8.4.1 A1-A3, Production stage, information modules

[ISO 21930 Section 7.1.7.2]: “The product stage includes:

- A1 Extraction and upstream production;
- A2 Transport to the factory;
- A3 Manufacturing.

Information modules A1 to A3 shall be included in every EPD. The system boundary with nature shall include those technical processes that provide the material and energy inputs into the system and the subsequent manufacturing and transport processes up to the factory gate, as well as the processing of any waste arising from those processes. All materials, products and energy, as well as processing up to the system boundary between product systems of disposal of final residues during the product stage shall be provided.” For a detailed description of what shall be included in modules A1-A3, refer to ISO 21930 Sections 7.1.7.2.2 – 7.1.7.2.4.

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

[ISO 21930 Section 7.1.7.1]: “Modules A1, A2 and A3 may be declared as an aggregated Module A1-3.”

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

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

- Production waste that is *recycled* without any modification of the material inherent characteristics (i.e. closed-loop or open-loop considered closed loop) can be considered as recycled within Modules A1-A3. This is only possible up to the volume that was used as input in production.



- 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 at the same quality within Modules A1-A3 and only to the maximum amount in MJ as is required of the respective energy quality in MJ during production (assumption: overall manufacturing, A1-A3, considered as a module).

If an allocation procedure different from co-product allocation is chosen for flows that reach the system at the boundary A1-A3, or datasets are chosen where allocation procedures are unknown, this procedure has to be justified or clarified as a dataset limitation. Ideally, datasets should be used that clarify allocation procedures. The resulting material and energy flows are to be described transparently in the project report with regard to the amounts of materials and energy within Module A1-A3.

2.8.4.1.1 Coproducts leaving system

[ISO 21930 Section 7.1.7.2.6]: “Co-products from unit processes leaving the system at the production stage (A1-A3) shall be allocated in accordance with ISO 21930 Section 7.2.5. Loads and benefits from allocated co-products shall not be declared in Module D.” (See Section 2.8.4.6 of this standard.)

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

2.8.4.1.2 Output of waste

[ISO 21930 Section 7.1.7.2.7]: “The output of waste during [the Production] life cycle stage may become a useable output flow, such as a secondary material/fuel or recovered energy, when it has been through a recovery process and complies with the conditions described in the system boundary between product systems (see ISO 21930 Section 7.1.6). These useable output flows shall not be considered as co-products but shall be considered waste and no allocation to secondary material, secondary fuels or recovered energy shall be permitted.”

While loads and benefits from allocated co-products shall not be declared in Module D, waste recovered as a useable output flows may be considered from recovery processes and included as supplementary information in module D.

2.8.4.2 A4-A5, Construction stage, Information modules

[ISO 21930 Section 7.1.7.3.1]: “The construction process stage includes the following two information modules A4 to A5:

- A4 Transport to site;
- A5 Installation;

Information modules A4 to A5 include provision of all materials, products and energy, as well as waste processing up to the system boundary between product systems or disposal of final residues during the construction stage. They also include all aspects and impacts related to any losses during this construction process stage (i.e. production, transport and waste processing and disposal of the lost products and materials).”

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

When a product is sold as a system, e.g. as a package including the installation materials, then the entire *production* of all components and product residues that might occur in A5 are

to be declared in A1-A3. The transport of the system to the site is to be declared in A4. The installation inclusive waste treatment is to be declared in A5.

[ISO 21930 Sections 7.1.7.3.2 – 7.1.7.3.3]: “The construction stage includes the optional information modules for:

- A4 Transportation from the factory gate to central warehouse or intermediate storage site, if relevant
- A4 Transportation to the construction site
- A4-A5 Storage of products, including heating, cooling, humidity control, etc.
- A5 Construction product waste (additional production and transport processes to compensate for the loss of product waste)
- A5 Waste processing of product packaging waste and product waste during the construction process up to the system boundary between product systems or disposal of final residues
- A5 Product installation into the construction works, including the manufacturing and transport of ancillary materials, direct energy use, and freshwater consumption required for installation
- A5 Site preparation required for product installation, including ancillary materials and waste management

Transport distances should be as specific as possible. The distance to the construction site may be estimated based on weighted average distance to the market of the product.

If no specific information for the efficiency of waste incineration plants (R1 value; see Section 2.8.7) of the incineration plant is available, it is assumed that packaging materials (and potential product waste from the installation process) are treated thermally in a plant with $R1 < 0.6$. Thus, the combustion process (loads) for the packaging is to be declared in Module A5, the resulting benefits in Module D.

The information in from ISO 21930 Section 7.1.7.3.4 shall be included, as below: “The information in [the following table] shall be provided for all construction products to specify the end-of-life scenarios used for packaging or to support development of the end-of-life scenarios for packaging at the construction works level where the module is not declared. Scenarios shall only model processes, for example recycling systems that have been proven to be economically and technically viable.

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

Table 1. A5 Product Packaging Waste (adapted from ISO 21930 Section 7.1.7.3.4, Table 2)

Module	Parameter	Unit (expressed per functional unit or per declared unit)	Value
A5 Installation of the product	Mass of packaging waste Specify by type	kg or other unit as appropriate	
A5 Installation of the product	GWP based in biogenic carbon content of packaging, specify by type, (where relevant)	kg CO ₂ e	

2.8.4.3 B1-B5, Use stage information modules

[ISO 21930 Section 7.1.7.4.1] “The use stage of the construction works includes information modules covering the period from the handover to when it is deconstructed or demolished.



The product level use stage may be vastly different when considered in the context of the construction works since the products will have varying RSLs, encounter differing exposure conditions (with corresponding ESLs) and might be replaced, repaired, and maintained several times over the span of the required service life of a construction works.”

“Any deviation from the categorization of aspects and impacts into modules B1 to B5 and B6 to B7 shall be reported in a transparent manner and justified.”

[ISO 21930 Section 7.1.7.4.2]: “The use stage of the construction works includes the following five information modules:

- B1 Use or application of the installed product
- B2 Maintenance (preventative and regular maintenance activities required for product function and technical performance, e.g. cleaning);
- B3 Repair (corrective, responsive, or reactive treatment of a product or its parts (e.g. a broken component), including preservation of aesthetic qualities);
- B4 Replacement (required when an entire product needs to be replaced, instead of a repairing a broken part or component);
- B5 Refurbishment (required to return a product to its functional condition during its service life, i.e. restoration).

This includes provision and transportation of all materials, products and related energy and water use, as well as waste processing up to system boundary between product systems or disposal of final residues during this part of the use stage. These information modules also include all aspects and impacts related to the losses during this part of the use stage (i.e. production, transport, waste processing and disposal of the lost products and materials).”

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

The B1 - B5 use stage information modules shall be covered according to ISO 21930 Section 7.1.7.4.2. Additional required assumptions for these information modules may be included in a sub-category Part B PCR.

2.8.4.4 B6-B7, Use stage information modules relating to operation of the construction works

[ISO 21930 Section 7.1.7.4.3.1]: “The use stage relating to the operation of the construction products includes the following two information modules:

- B6 Operational energy use (e.g. operation of a heating system and other technical construction works-related installed services);
- B7 Operational water use;

Information modules include provision and transport of all materials, products, as well as energy and water provisions, waste processing up to the system boundary between product systems or disposal of final residues during this part of the use stage.”

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

B6 - B7 use stage information modules shall be covered according to ISO 21930 Sections 7.1.7.4.3.2 - 7.1.7.4.3.3.

2.8.4.5 C1-C4, End-of-life stage information modules

The declaration of Module C is required in an EPD unless either of the following conditions are met¹:

1. Life cycle data for end-of-life is included and broken out separately in the LCA project report, in addition to one of the following:
 - ▶ Recycling is directly controlled or supported by manufacturer, OR
 - ▶ Landfill generic data per the product category is used, and has been standardized for comparability.OR
2. A qualitative statement is provided in the LCA and EPD describing the typical end-of-life treatment of the product, including:
 - ▶ Typical end-of-life scenarios are outlined
 - ▶ Recycling is reported as average or product specific recycling rates and standard reporting procedures are outlined, such as manufacturer take-back programs
 - ▶ Biogenic carbon content/potential for decay is addressed

The end-of-life information modules are as follows, and should be covered per ISO 21930 Section 7.1.7.5:

- C1 Deconstruction/Demolition (includes dismantling or demolition of the product from the site and the required energy to do this, including on-site material sorting)
- C2 Transportation to waste processing or disposal
- C3 Waste processing (includes collection of waste from deconstruction, recovery, and waste processing of material flows resulting in materials for reuse, secondary materials, secondary fuels, or export of energy recovered from waste with an efficiency of at least 60%, regardless of existing legislation)
- C4 Disposal of waste

It is important to note that if there are, for example, three different recovery and disposal options for a product system, the most commonly used one, or all three scenarios, shall be declared separately. Also, per ISO 21930 Section 7.1.7.5, “A scenario based on a typical end-of-life, for example a mix of recovery and disposal options based on a national situation, shall only be provided if the scenarios for the separate individual options are also provided.”

©ISO. This material is from ISO 21930:2017 with permission of the American National Standards Institute (ANSI) on behalf of the International Electrotechnical Commission. All rights reserved.

A sub-category Part B PCR may provide additional requirements regarding product disposal pathway assumptions beyond what is provided in Section 2.8.5.

The end-of-life system boundary of the construction product system to Module D is set where outputs, i.e. secondary materials or fuels, have reached system boundary between product systems or disposal of final residues.

¹ This is a USGBC PCR guidance document requirement, in addition to the requirements listed in ISO 21930 Section 5.2.1.