PRODUCT CATEGORY RULES (PCR)
DATE 2019-09-06

BUILDINGS

PRODUCT CATEGORY CLASSIFICATION: UN CPC 531

2014:02
VERSION 2.01

VALID UNTIL: 2022-01-24

TABLE OF CONTENTS

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

GENERAL INTRODUCTION TO PRODUCT CATEGORY RULES IN THE INTERNATIONAL EPD® SYSTEM

This document constitutes Product Category Rules (PCR) developed in the framework of the International EPD® System; a programme for type III environmental declarations according to ISO 14025:2006. Environmental Product Declarations (EPD®) are voluntary documents for a company or organisation to present transparent information about the life cycle environmental impact for their goods or services.

The rules for the overall administration and operation of the program are the General Programme Instructions, publicly available at the website (www.environdec.com). In addition to ISO 14025, the International EPD® System adheres to the following international standards:

- ISO 9001, Quality management systems
- ISO 14001, Environmental management systems
- ISO 14040, LCA - Principles and procedures
- ISO 14044, LCA - Requirements and guidelines

For construction products, the International EPD® System also allows the use of EN 15804 (Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products) and ISO 21930 (Environmental declaration of building products) as the main underlying standards. The compliance with these and other standards shall be clearly stated in each PCR and EPD® where it is relevant.

A PCR is defined in ISO 14025 as a set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories. The PCR document specifies the rules for the underlying life cycle assessment (LCA) and sets minimum requirements on EPDs for a specific product group that are more detailed than the standards and the General Programme Instructions.

PCRs in the International EPD® System are developed in English in accordance with the procedure described in the General Programme Instructions. All PCR documents have a maximum period of validity after which the document shall be revisited. The template used for this PCR is based on the PCR template provided by the Guidance for Product Category Rule Development (2013).

Within the present PCR, the following terminology is adopted, as defined by the Guidance for Product Category Rules Development v1.0:

- The term “shall” is used to indicate what is obligatory.
- The term “should” is used to indicate a recommendation, rather than a requirement.
- The term “may” or “can” is used to indicate an option that is permissible

EPDs are developed and registered based on a valid PCR. An EPD® shall be based on the latest version of the PCR, and refer to the version number and date of the PCR used. The production of new PCR versions does not affect the certification period of EPDs that are already published.

This PCR document is publicly available at www.environdec.com. The PCR document is a living document. If relevant changes in the LCA methodology or in the technology for the product category occur, the document will be revised and the new version will be published on the website.

Stakeholder feedback on PCRs is very much encouraged. Any comments to this PCR document may be given on the PCR Forum on www.environdec.com or directly to the PCR moderator during its development or during the period of validity.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

1 GENERAL INFORMATION

1.1 ADMINISTRATIVE INFORMATION

Name:	Buildings
Registration number:	2014:2, version 2.01
Programme operator:	The International EPD® System operated by EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden. Website: www.environdec.com E-mail: info@environdec.com
Appointed PCR moderator:	Ulf Wiklund, Tyréns AB (ulf.wiklund@tyrens.se)
PCR Committee:	Tyréns AB
Date of publication:	2019-09-06 (Version 2.01)
Date of expiration:	2022-01-24
Schedule for renewal:	When the validity time is about to expire the PCR moderator shall initiate a discussion with the programme operator how to proceed with updating the document and extending the period of validity. See General Programme Instructions.
Standards conformance:	The following guidelines and standards have been considered and aim to comply with: ▪ General Programme Instruction of the International EPD® System, version 3.0, based on ISO 14025 and ISO 14040/14044 ▪ PCR Basic Module, CPC Division 53, version 2.5, dated 2015-12-22 ▪ EN 15804:2012+A1:2013 – Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products ▪ EN 15978:2011 – Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method
PCR language:	This PCR is developed and is available in English, as is mandated by the General Programme Instructions.
Comments on the PCR:	Any comments to this PCR document may be given on the PCR Forum on www.environdec.com or sent directly to the PCR moderator during the period of validity.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

1.2 SCOPE OF PCR

1.2.1 PRODUCT CATEGORY DEFINITION

This document provides Product Category Rules (PCR) for the assessment of the environmental performance of buildings corresponding to UN CPC 531 and the declaration of this performance by an EPD® (http://unstats.un.org/unsd/cr/registry/regcs.asp?Cl=25&Lg=1&Co=531):

- **Group: 531 – Buildings**
  - Class: 5311 – Residential buildings
    - Subclass: 53111 - One- and two-dwelling residential buildings
    - Subclass: 53112 - Multi-dwelling residential buildings
  - Class: 5312 – Non-residential buildings
    - Subclass: 53121 - Industrial buildings
    - Subclass: 53122 - Commercial buildings
    - Subclass: 53129 - Other non-residential buildings

The product group and CPC code shall be specified in the EPD.

The International EPD® System offers the possibility for similar products to be included in the same EPD®. See the General Programme Instructions for more information.

1.2.2 SPECIFICATION OF MANUFACTURING COMPANY

Required information about the manufacturing company is reported in the table below, separated between mandatory and voluntary information.

Table 1. Mandatory and examples of voluntary information about the manufacturing company.

Mandatory information	**Examples of voluntary information**
Name of the contractor	Name of organization, architect, etc.
Commissioner of the building project	Specific aspects regarding the contract form
Production site	Specific aspects regarding the production
Issuer and contacts	Environmental policy
Information on environmental management system	Manufacturers logotype
	Others

1.2.3 SPECIFICATION OF THE PRODUCT

A building can be described as a sustainable construction consisting of a roof, or roof and walls, permanently placed on ground, intended to be designed so that people can reside in it. The term *building* includes the function that it is designed for people to reside within.

A building can vary in shape, size and function, which affects how it is built and requirements it must meet. *Table 2* describes how buildings are divided into different classes. The classification of building types is a way to specify the building's function, and by doing so the environmental performance of buildings with the same function can be compared.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table 2. Classification of building types.

Building types[1]	**Description**	**Examples**
Residential	Buildings used, fully or partially, for year-round dwelling purposes and that consist of one or several habitable rooms and is equipped with kitchen, kitchenette or cooking area.	
Individual dwelling and collection of two individual dwellings	Buildings that contain one or two dwellings.	Detached house Terraced houses Row houses
Apartment block	Buildings that contain three or more dwellings.	Co-operative flat Tenancy
Commercial		
Office	Buildings used for business, clerical, or professional activities.	General offices Offices with R&D labs
Retail	Buildings used for selling by retail to yield income.	Shop/Shopping centre Retail park or Warehouse Restaurants/Cafes Hot food takeaway Financial, estate and employment agencies, and betting offices
Industrial	Buildings used for production/manufacturing/processing activities.	Unit for processing/manufacturing Storage Vehicle servicing
Hotels or Residential institutions	A managed and/or provided place of residence to people not of the same family or of direct relationship.	Hotels/Hostels/guest house Secure training center Local authority secure residential accommodation Residential collage/school Residential care home Military barrack Sheltered accommodation Local authority secure residential accommodation
Education		Preschools Schools and collages University Higher education institutions
Non-standard building types, bespoke	Buildings that include activities designated to serve and/or to be used by the public.	Community or visitor centre Town hall or civic centre Conference facility Theatre or concert hall Sports or leisure facility (with or without a pool) Library Cinema Hospital and other healthcare facility Prison Law court Police station Fire station Transport hub (coach, bus or rail station) Gallery or museum Place of worship Research and development (category 2 or 3 laboratories - non-higher education)

In cases where a single building has a number of several dominant functions, i.e. a mixed-use building where each individual function contributes to more than 10 % of the building's total environmental burden, a separate environmental performance declaration is required for each dominant function.

In cases where the building has single or multiple less significant functions, those less significant functions may be exempted from separate classification if their environmental contribution or aggregated environmental contribution is less than 10 % of the building's total environmental burden. If, however, the aggregated environmental burden of those less significant functions exceeds 10 % of the total environmental burden – e.g. five separate functions altogether account for 15 % of the building's total environmental burden – the aggregated results may be classified as "other". For declaration of environmental performance related information, see Section 0.

[1] The classification of the building types are based on BREEAM International New Construction Technical Manual 2016.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

New and existing buildings

This PCR handles both new buildings and existing buildings. For new buildings, all life cycle stages shall be reported. For existing buildings' generic data may be used when modelling the construction (A1-A3) and production (A4-A5) stage. The use stage (B1-B7) and end-of-life (C1-C4) shall be reported. Repair scenarios should be modelled by the history of the building.

Construction Method

A building can be (i) built on site, (ii) built on site with prefabricated parts or (iii) be entirely prefabricated. This PCR accounts for (i) and (ii). For prefabricated buildings (iii) see separate PCR prefabricated buildings (PCR 2013:01 covering UN CPC 387), available at www.environdec.com.

Components of the building

The object of assessment is the building, including its foundations and external works within the curtilage of the building's site, where the buildings site is defined as the physical space of land that is occupied by the building.

The building structure can be described with number of storeys, structural frame and foundations, beams, columns, slabs, external and internal walls, windows, doors, stairs, roof, ceiling, floor, etc. In addition, the facilities required for the building's function to be met shall be included. This includes the system of water supply and drainage, sanitary systems, heating and water heating, cooling, ventilation, electrical systems and elevators. Legal or project requirements on f ex energy efficiency, fire safety or noise reduction may also be described.

Earthworks may be reported separately, and shall always be included in the total environmental impact of the building.

Furnishings, such as kitchen fixtures, bathroom fittings, wallpapers, etc., shall not be included in the system boundaries.

1.2.4 GEOGRAPHICAL REGION

The geographical setting for the scope of this PCR is global.

1.2.5 EPD® VALIDITY

The maximum validity of EPDs based on this PCR shall be five years after which the declaration must necessarily be revised and reissued.

During the validity period of the EPD, surveillance follow up shall be agreed between the EPD owner and the verifier in order to evaluate if the content are still consistent with the current situation, or if the EPD must be updated. See the General Programme Instructions of the International EPD® System for further information and requirements.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

2 PCR REVIEW AND BACKGROUND INFORMATION

2.1 PCR REVIEW

2.1.1 VERSION 1.0

Version 1.0 was reviewed by the Technical Committee of the International EPD® System.

2.1.2 VERSION 2.0

PCR review panel:	The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com/TC. The PCR review panel may be contacted via info@environdec.com. Members of the Technical Committee were requested to state any potential conflict of interest with the PCR moderator or PCR committee, and were excused from the review.
Review dates:	2017-11-20 until 2017-12-18
Chair of the PCR review:	Lars-Gunnar Lindfors

2.2 OPEN CONSULTATION

2.2.1 VERSION 1.0

Version 1.0 was available for open consultation on www.environdec.com from 2012-11-05 until 2012-12-31.

2.2.2 VERSION 2.0

This PCR was available for open consultation from May 17th until July 17th, during which any stakeholder was able to provide comments by posting on the PCR forum on www.environdec.com or by contacting the PCR moderator. A workshop was held in Stockholm the 17th of May 2017, with both physical and web-based participants, where the PCR draft was presented and discussed.

Stakeholders were invited via e-mail or other means to take part in the open consultation, and were encouraged to forward the invitation to other relevant stakeholders. The stakeholders provided comments during the open consultation. These comments have been taken into account when completing this PCR.

2.3 EXISTING PCRS FOR THE PRODUCT CATEGORY

This PCR replaces the expired PCR 2014:02 Buildings, version 1.0, International EPD® System. No similar PCRs from another programme have not been found.

2.4 REASONING FOR DEVELOPMENT OF PCR

In order to update and replace the expired PCR 2014:02 Buildings version 1.0, this PCR harmonizes with the PCR Basic Module template dated 2015-12-22. This version of the PCR handles comments given on the previous version.

2.5 UNDERLYING STUDIES

Studies of adjacent PCRs has been made, for example PCR 2015:05 Lifts (elevators). An EPD for building has been studied; Folkhem's concept building. LCA reports of different building types (commercial industrial and retail buildings, residential apartment blocks, different building systems-Wäludden) has been studied; see Section 9 for references.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

BREEAM International New construction 2016 manual, LEED Reference guide Design and Construction V4 has been studied as well as the Swedish building certification system Miljöbyggnad (Sweden Green Building Counsel).

3 GOAL AND SCOPE

3.1 FUNCTIONAL UNIT

The functional unit shall be declared in the EPD. The environmental performance shall be given per functional unit.

The functional unit is a building of a particular building type with a lifespan (RSP) of 50 years.

The EPD shall follow a “cradle to grave” approach i.e. including all life cycle stages of the building; see Table 3. The building type symbolises a certain function, as classified in Table *2*, and comparisons shall only be made between buildings with the same function.

The environmental performance of the building is directly dependent on its size, why the environmental burden shall be reported per square meter gross internal area[2] (GIA), which is defined as areas occupied by internal walls (whether structural or not) and partitions. This includes service accommodation such as WCs, showers, and changing rooms; columns, piers, whether free standing or projecting inwards from an external wall, chimneybreasts, lift wells, stairwells and so on. It also includes lift rooms, plant rooms, tank rooms, fuel stores, whether or not above roof level, open-sided covered areas (should be stated separately). Gross internal area excludes open balconies, open fire escapes, open-sided covered ways, open vehicle parking areas, terraces and so on, minor canopies, any area with a ceiling height of less than 1,5 m (except under stairways), any area under the control of service or other external authorities.

The reference unit GIA, allows different buildings of the same type to be compared with each other, even though they are of different sizes or have different design. In addition to accounting for the environmental performance per square meter GIA, the building's overall environmental performance shall also be reported.

Table 3. Definition of the functional unit of the building.

Approach	**Life cycle stages (**Figure 1**)**	**Functional unit(s)**
Cradle to grave	A1-A3, A4-A5, B1-B7, C1-C4	A building of a specific type (see *Table 2*) with a lifespan of 50 years. The building’s overall environmental impact and the environmental impact per square meter GIA shall be reported.

3.2 SERVICE LIFE

The service life of a building, component, or material is usually defined as the period of time in which the performance meets or exceeds initial requirements. When calculating the emissions over a lifetime of a building, it is necessary to distinguish between the service life of the whole building and the service life of components and construction materials. There are several definitions of service life at the building level, the reference service life (RSL), the required service life (ReqSL) and the estimated service life (ESL). RSL data is rarely satisfactorily due to in-use condition specific to the design object usually are different from the reference in-use conditions. I.e. the in-use under which the RSL data are valid. In order to determine an appropriate ESL it is necessary to modify the RSL by taking into account the differences between the object specific in-use conditions. This shall be established in accordance with ISO 15686-1 and -8.

3.2.1 REFERENCE STUDY PERIOD (RSP)

RSP is the period over which the time-dependent characteristics of the object of assessment are analysed (NS-EN 15978: 2011). Maintenance, repair, replacement and refurbishment activities, as well as operational energy and water use, and may contribute differently to the environmental impacts over the life cycle.

The reference study period, predefined in this PCR for comparison purposes, is set to 50 years.

[2] Definition of GIA can be found e.g. at www.gov.uk

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

3.2.2 REQUIRED SERVICE LIFE (REQSL)

The ReqSL is the service life of construction works required by the client or through regulations (NS-EN 15643-1).

Typically, the default value for the reference study period is the required service life of the building. However, this is not always the case. Any deviations from this shall be clearly stated and reasons explained. If the RSP differs from the ReqSL, modules B1-B7 and module D are multiplied by the ratio of the reference study period to the required service life (RSP/ReqSL).

3.2.3 REFERENCE SERVICE LIFE (RSL)

The reference service life is the service life of a construction product that is expected under a reference set of in-use conditions, and which can form the basis for estimating the service life under other in-use conditions.

The RSL is applied to the functional unit, for the calculation of replacement (B4) and refurbishment (B5) of construction products (see Sections 6.4 and 6.5).

3.3 SYSTEM DIAGRAM

The system diagram is shown in Figure 1 and is explained in the following sections of Chapter 0.

For new buildings, the system boundary shall include the building life cycle: A1-3, A4-5, B1-7 and C1-4. For existing buildings (or part thereof), the system boundary shall include all stages representing the remaining service life and the end-of-life stage of the building.

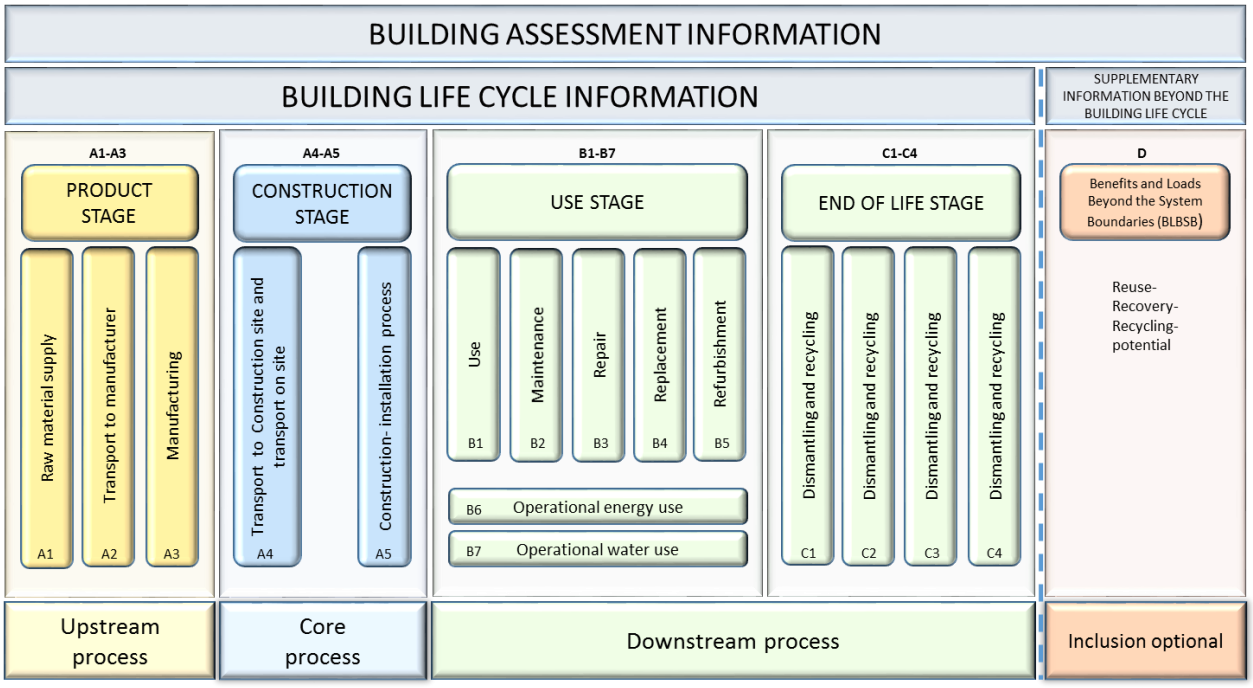

Figure 1. Building life cycle system boundaries, illustrated with SS-EN 15804 as reference.

3.4 SYSTEM BOUNDARIES – ATTRIBUTABLE

The International EPD® System has adopted an LCA calculations procedure, which is separated into three different life cycle stages:

- Upstream processes (from cradle-to-gate);
- Core processes (from gate-to-gate)
- Downstream processes (from gate-to-grave)

In the EPD®, the environmental performance associated with each of the three life-cycle stages above shall be reported separately.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Boundaries to nature are defined as flows of material and energy resources from nature into the system. Emissions to air, water and soil cross the system boundary when they are emitted from or leaving the product system.

LCI data shall be representative for the actual processes and representative for the country or region where the respective process is taking place. In rare cases where no other information is available, global data, e.g. average global values, may be used.

The following chapters describes the attributional processes connected to upstream, core and downstream processes. Please note that these chapters give a general description and that not all processes are relevant for every type of product included in this PCR.

3.4.1 UPSTREAM PROCESSES

The following attributional processes are part of the product system and classified as upstream processes that shall be included:

- **A1 Raw material supply**
  - Extraction and processing of raw materials/e.g. mining processes) and biomass production and processing (e.g. agricultural or forestry operations);
  - Reuse of products or materials from a previous product system;
  - Processing of secondary materials used as input for manufacturing the product, but not including those processes that are part of the waste processing in the previous product system;
  - Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport;
  - Energy recovery and other recovery processes from secondary fuels, but not including those processes that are part of waste processing in the previous product systems.
- **A2 Transport**
  - Transportation up to the factory gate and internal transports.
- **A3 Manufacturing**
  - Production of ancillary materials or pre-products;
  - Manufacturing of products and co-products;
  - Manufacturing of packaging;

  The technical system shall not include:
  - Manufacturing of production equipment, buildings and other capital goods.

  Upstream processes not listed may also be included. All elementary flows at resource extraction shall be included, except for the flows that fall under the general 1 % cut-off rule.

3.4.2 CORE PROCESSES

The following attributional processes are part of the product system and classified as core processes, including if significant and relevant:

- **A4 Transport to and from site**
  - Transport of materials and products from the factory gate to the building site, including any transport, intermediate storage and distribution;
  - Transport of construction equipment (cranes, scaffolding, etc.) to and from the site;
  - All impacts and aspects related to losses due to the transportation (i.e. production, transport and waste management of the products and materials that are damaged or otherwise lost during transportation).

  Transport of persons to and from the site shall not be included.
- **A5 Construction and installation**
  - Ground works and landscaping;

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

- Storage of products, including the provision of heating, cooling, humidity, etc.;
- Transport of materials, products, waste and equipment within the site;
- Temporary works, including temporary works located off-site as necessary for the construction installation process;
- On-site production and transformation of a product;
- Provision of heating, cooling, ventilation, humidity control etc. during the construction process;
- Installation of the products into the building including ancillary materials not counted in the EPD of the products e.g. releasing agents in formworks for concrete, formworks discarded at the end of the project;
- Water use for cooling of the construction machinery or on-site cleaning;
- Waste management processes of other wastes generated on the construction site. This includes all processes (including transportation from the building site) until final disposal or until end of waste state is reached;
- Production, transportation and waste management of products and materials lost during the construction and installation process.

3.4.3 DOWNSTREAM PROCESSES

The downstream processes are divided into boundaries for the use stage (module B1-B7) and boundaries for the end-of-life stage (module C1-C4). These shall be included:

Use stage

- **B1 Installed products in use**

  Module B1 reports of activities, materials and emissions related to the building's normal uses that are not covered by the Modules B2-B7. Continuous emissions from materials in the house are included, for example, substances from the facade, roof, floor covering and other surfaces (interior or exterior) emitted to air, soil or water.

- **B2 Maintenance**

  Module B2 includes scheduled maintenance that is required in the daily work of building operations, including on-going maintenance of the property, preventive and regular maintenance such as cleaning or replacement/maintenance of worn parts. Water and energy required for cleaning shall be included in this module (not in Module B6-B7).

  In addition, this module includes:

  - The production and transportation of the components and ancillary products used for maintenance;
  - All cleaning processes of the interior and exterior of the building;
  - All processes for maintaining the functional and technical performance of the building fabric and building integrated technical systems, as well as aesthetic qualities of the building’s interior and exterior components, including water and energy use
  - 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
  -

- **B3 Repair**

  Module B3 refers to measures that are not typically scheduled during the lifetime of the building. This includes corrective and preventive handling of a product or installation when it is broken or out of order, so that the required function and performance is achieved. Replacement of a faulty component or part due to injury should be reported in this module, while the replacement of an entire product design or significant part of the building to be reported in replacement (Module B4). This shall be included for existing buildings where the repair history is available. If no data is available for new buildings, module B3 may be omitted. This omission must be thoroughly explained and justified.

  Module B3 includes:

  - The production of the repaired part of a component and of ancillary products used for repair;

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

- The transportation of the repaired part of component and of ancillary products, including production impacts and aspects of any losses of material during transportation;
- The repair process of the repaired part of component and ancillary products including related water and energy use;
- Transportation of any waste from repair processes or from repair related transportation;
- The end-of-life processes of any waste from transportation and the repair process, including any part of the component and ancillary materials removed.

- **B4 Replacement**

  Module B4 refers to when a material, part of the building or installation is exchanged for a new product. This may be e.g. replacement of windows, facade replacement or replacement of heat exchangers. If a building component is changed as part of a refurbishment program, this shall be reported during the refurbishment module (Module B5), otherwise it shall be reported in this module. If a building is changed because it has been destroyed, it should be reported in the repair module (Module B3).

  Module B4 includes:

  - The production of the replaced component and of ancillary products used for replacement;
  - The transportation of the replaced component and ancillary products, including production impacts and aspects of any losses of materials during transportation;
  - The replacement process of the replaced components and ancillary products including related water and energy use;
  - Transportation of any waste from replacement processes or from replacement related transportation;
  - The end-of-life processes of any waste from transportation and the replacement process, including any part of the component and ancillary materials removed.

- **B5 Refurbishment**

  Module B5 data typically originates from a coordinated and planned maintenance program for refurbishment. The refurbishment of a building includes a significant part or whole section of the building.

  Module B5 includes:

  - Production of the new building components and of ancillary materials used for refurbishment;
  - Transportation of the new building components including production of any materials lost during transportation;
  - Construction as a part of the refurbishment process including production of any material lost during refurbishment and related water and energy use;
  - Transportation of any waste from refurbishment processes or from refurbishment related transportation;
  - The end-of-life processes of any waste from transportation and the refurbishment process, including any part of the component and ancillary materials removed.

- **B6 Energy use to operate building integrated technical systems**

  The system boundaries for Module B6 shall include the energy used in the operating phase of the technical systems that are integrated into the building. The integrated building technical systems are installed technical equipment supporting operation of a building including:

  - Heating, cooling, humidification/de-humidification, ventilation;
  - Lighting;
  - Domestic hot water for sanitation and other systems for sanitation;
  - Auxiliary energy used for pumps, lifts, escalators, control and automation;
  - Safety and security installation and communication systems.

  If the energy use of appliances that are not building-related (plug in appliances, e.g. computers, washing machines, refrigerators, audio, TV and production or process-related energy in the use of the building) is included within the energy calculation, then this shall be documented and reported separately, including the environmental information associated with such energy consumption.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

The energy use in the building refers to the activity and processes as presented in EN 15603. The calculation method used for heating and cooling energy shall however be specified. Moreover, if semi-steady methods have been used, supplementary information on energy needs calculated by dynamic method should be reported.

Energy aspects related to the production, transportation and installation of equipment required to supply energy to the building shall be assigned to modules A1-A5. Energy use during maintenance, repair, replacement or refurbishment activities for the equipment shall be assigned to modules B2-B5. Aspects related to the waste processing and final disposal of equipment shall be assigned to modules C1-C4.

- **B7 Operational water use by building integrated technical systems**

The module covers the period from the handover of the building to when the building is deconstructed or demolished.

The boundary of this module shall include the consumption of net fresh water (potable water) during the operation of the integrated building technical systems, together with its associated environmental aspects and impacts considering the life cycle of water including production, transportation and wastewater treatment.

Examples of integrated building technical systems included in this module are systems for:

- Heating, cooling, ventilation and humidification;
- Domestic hot water for sanitation and other systems for sanitation;
- Security, fire safety and internal transport;
- Irrigation of associated landscape areas, green roofs, green walls;
- Other specific water use of building-integrated systems e.g. fountains, swimming pools, saunas.

If water use of appliances that are not building-related (e.g. dishwashers, washing machines) is included within the assessment, this shall be reported and communicated separately. Water consumed by users of the building shall not be included, e.g. drinking water etc.

End-of-life stage

The end-of-life stage starts when the building is decommissioned and is not intended for any further use, and ends when all components and materials that were to be cleared from the site have been removed and the site is ready for re-use. The scenarios shall be restricted to the on-site processes and activities. The end-of-life stage includes:

- **C1 Deconstruction and demolition**

Deconstruction, dismantling and/or demolition of the building, including initial on-site sorting of the materials.

- **C2 Transport**

Transports for disposal of the discarded materials and products, i.e. to final disposal and/or all transports until the end-of-waste stage is reached.

- **C3 Waste processing for reuse, recovery or recycling**

Collection of waste fraction from the deconstruction site and waste processing of the materials intended for reuse, recycling and energy recovery, i.e. waste processing until the end-of-waste stage is reached.

Materials from which energy is recovered are considered materials for energy recovery if the efficiency rate of the energy recovery process is 60 % or higher, without prejudice to existing legislation. Materials from which energy is recovered with an efficiency rate below 60 % are considered materials for incineration (from which the environmental loads are declared in module C4).

NOTE 1. Processing after the end-of-waste stage is reached, in order to replace primary materials or fuels (as secondary materials or fuels) in another product system, are considered beyond the building's system boundaries and are assigned to module D.

NOTE 2. Materials can only be considered as materials for energy recovery if they have reached the end-of-waste state.

- **C4 Waste disposal**

Physical pre-treatment of waste for final disposal and management of the disposal site. Module C4 quantifies all environmental loads resulting from final disposal of materials, e.g. neutralisation, incineration (with or without utilization of energy) and landfilling (with or without utilization of landfill gases).

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Environmental loads from waste disposal are considered part of the building's product system, according to the "polluter pays principle". If the waste disposal process generates energy such as heat and power, the potential benefits from utilization of such energy in the next product system are assigned to Module D.

3.4.4 SUPPLEMENTARY INFORMATION BEYOND THE BUILDING LIFE CYCLE

As one option, it is possible to declare potential environmental loads and benefits of secondary material, secondary fuel or recovered energy leaving the product system.

- **D Benefits and loads beyond the system boundary**

Components for reuse and materials for recycling or energy recovery (secondary materials or fuels) are considered as potential resources for future use. Module D quantifies the net environmental benefits or loads resulting from reuse, recycling and energy recovery calculated from the net flows of materials and exported energy exiting the system boundary. The calculations for module D shall be done according to EN 15804.

3.5 CONTENT DECLARATION

The EPD® shall include a content declaration of the construction products covering relevant materials and substances included in the building itself. Resources, which contribute 1% or more of the different resource use categories, shall be listed and detailed. Content of regulated substances within the geographical regions for which the EPD is valid shall be declared as well as the geographical validity of the EPD.

The declaration of material content of the construction products used in the building shall list, as a minimum, substances contained in the construction products that are listed in the "Candidate List of Substances of Very High Concern (SVHC) for authorisation" when the substance content exceeds 0.1 weight-% of the construction product. SVHC are listed by European Chemicals Agency and includes the Candidate List of SVHC.

An optional detailed list of the construction product's substances, including CAS number, environmental class and health class, may be included in the construction product content declaration. It is also recommended to include substances' functions in the construction product (e.g., pigment, preservative, etc.). Other information may be added if needed, e.g. EC number. An optional detailed content declaration is illustrated in Table 4.

Table 4. An example of an illustrative detailed construction product content declaration, (example written in italic).

All materials/components/ construction product	**Substances**	**Weight %***	**CAS number**	**Environmental class**	**Health class**
Structure	*Polyethylene*	*90%*			
Pigment	*Titanium dioxide* *Iron oxides fume*	*6 +/-3* *2*	*13463-67-7* *1309-37-1*	*No* *Data lacking*	*R 37* *Data lacking*
Preservative	—**	*3*	—	*no*	*R 46*
Etc.					
…					
Other, non-allergenic, health-sensitive or environmentally-sensitive substances		*<1%*	—	*no*	*no*
Total		***100***			

** Figures can alternatively be given in e.g. g/kg.*
*** The product content declaration shall report if the substance is confidential.*

The content declaration shall also report all substances' inherent properties that are regarded as hazardous. These hazardous substances may be reported with the applicable risk classification, as per the regulations for those markets where the product will be used.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

3.6 UNITS AND QUANTATIES

The International System of Units (SI units) shall be used. The preferred power and energy units are:

- kW (MW) for power
- kWh (MWh) for energy

A maximum of three significant digits shall be used when reporting LCA results.

The thousands separator and decimal mark in the EPD® shall follow one of the following styles:

- SI style (French version): 1 234,56
- SI style (English version): 1 234.56

In case of any potential confusion, the EPD® shall state what symbols are used for thousand separator and decimal mark.

Dates and times presented in the EPD® should follow the format in ISO 8601 Data elements and interchange formats – Information interchange – Representation of dates and times. For years, the prescribed format is YYYY-MM-DD, e.g. 2015-03-26 for March 26th, 2015.

4 LIFE CYCLE INVENTORY

Life cycle inventory (LCI) data for a minimum of 99 % of total inflows to the core module shall be included. Inflows not included in the LCA shall be documented in the EPD. It is important to emphasize that – in most cases – all available data shall be used. Using cut-off rules should not give the perceptions of "hiding" information, but rather, to facilitate the data collection for practitioners.

Data on life cycle of materials or energy inputs are classified into three categories - specific data, selected generic data and proxy data, defined as follows:

- **Specific data** (also referred to as primary data, measured data or site-specific data) – data gathered from the actual manufacturing plant where product-specific processes are carried out, and data from other parts of the life cycle traced to the specific product system under study, e.g. materials or electricity provided from a contracted supplier being able to provide data for the actual delivered services, transportation taking place based on the actual fuel consumption and related emissions, etc. Specific data for a building refers to data over which the developer of the EPD has influence. Specific data can be based on selected generic databases where for instance the travel distance, specific travel means (e.g. environmental classification) and fuel consumption account for the specific data information.
- **Generic data** (sometimes referred to as secondary data), divided into:
  - **Selected generic data** – data from commonly available data sources (e.g. commercial databases and free databases) that fulfil prescribed data quality characteristics for precision, completeness and representativeness,
  - **Proxy data** – data from commonly available data sources (e.g. commercial databases and free databases) that do not fulfil all of the data quality characteristics of "selected generic data".
  - **Aggregated data**- either for the object of assessment as a whole (e.g. volume height, floor area, energy, consumption, water consumption) or for major components (e.g. walls, floors, roofs)

A summary of the data quality that shall be used in the different modules in this PCR is given in Table 5.

Table 5 Application of generic and specific data.

Process type	Upstream processes	Core processes	Downstream processes
Data type	Manufacturer's average or specific data if available from e.g. an approved EPD. Otherwise selected generic data or other generic data	Specific data	Selected generic data or proxy data

Table 6 presents the types of data that may be used at different stages of the assessment for quantification of the gross amounts.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table 6. Type of data. NOTE: Cross represents the preferred use of data – Circle represent alternative sources if available. Modified from EN15978:2011.

Preferred data	Point of the time of the assessment				
	Inception/ concept design	**Detailed design**	**Construction**	**Use stage**	**End of life of the building**
Proxy data	X	X	X	X	X
Aggregated data	X	X			
Product generic data	O	X	X	X	X
Product specific data	O	X	X	X	X
Model scenarios for use stage	X	X	X	X	
Measured data			X	X	X

Any data used should preferably represent average values for a specific year. However, the way these data are being generated could vary e.g. over time, and in such cases they should have the form of a representative annual average value for a specified reference period.

The data shall be representative for the year/time frame for which the EPD is valid. 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 data.

The EPD may include a data quality declaration to demonstrate the share of specific data, selected generic data and proxy data for the environmental impacts.

If relevant, the EPD may include a reference to the database(s) used.

Any deviations shall be declared.

4.1 REQUIREMENTS REGARDING COLLECTION OF SPECIFIC DATA

Specific data shall be gathered from the actual manufacturing plant(s) where specific processes are carried out and data from other parts of the life cycle traced to the specific product system under study. Examples are materials or electricity provided from a contracted supplier being able to provide data for the actual delivered services, transportation taking place based on the actual fuel consumption and related emissions, etc.

If an approved EPD or PCR (within the International EPD® System or other EPD-programmes) exists for a product or service that is similar to a product or service within the system under study, data from that EPD can be used as specific data and the PCR can be used for developing specific data, under the condition that all critical system boundaries are similar.

4.2 REQUIREMENTS REGARDING GENERIC DATA

The attributional (“book-keeping”) LCA approach in the International EPD® System forms the basic prerequisites for selecting generic data. This means that data based on a consequential systems’ approach shall not be used. Data calculated with substitution (system expansion where include benefits from “avoided production”) to solve allocation problems should not be used, but if no other data is available, such data may be accepted as proxy data if negative flows are changed to zero.

For allowing the use of selected generic data selected prescribed characteristics for precision, completeness and representativeness must be fulfilled and demonstrated, including but not limited to:

- Reference year to be as actual as possible, preferably being representative for at least 5 years,
- Cut-off criteria to be met on the level of the modelled product system are the qualitative coverage of at least 99% of-both the energy, the mass, and the overall relevance of the flows,
- Completeness where the inventory data set should in principle cover all elementary flows that contribute to a relevant degree of the impact categories, and
- Representativeness of the resulting inventory for the good or service in the given geographical reference should, as a general principle, be better than ±5 %.

Based on these prerequisites, the Ecoinvent database or similar data shall be used when applying selected generic data. If selected generic data that meets the requirements of the International EPD® System are not available as the necessary input data, proxy data

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

may be used and documented. The environmental impacts associated to proxy data must not exceed 10% of the overall environmental impact from the product system.

4.3 MODELING PARAMETERS AND ASSUMPTIONS

4.3.1 GENERAL ASSUMPTIONS REGARDING ENERGY USE

Electricity production impacts should be accounted for in this priority when specific data is used in the processes:

1. Specific electricity mix from electricity supplier as documented by Renewable Energy Certificates (RECs) or Guarantees of Origin,
2. Electricity supplier's residual electricity mix,
3. National electricity production mix/electricity mix on the market (preferably residual mix, otherwise national electricity production mix).

The mix of electricity used shall be documented, where relevant.

4.3.2 GENERAL ASSUMPTIONS REGARDING WATER RESOURCE

The following requirements for the water resource use indicators apply (in part adopted from water footprint inventory in ISO 14046 Environmental management - Water footprint - Principles, requirements and guidelines):

- Water use includes evaporation, transpiration, product integration, release into different drainage basins or the sea, displacement of water from one water resource type to another water resource type within a drainage basin (e.g. from groundwater to surface water). In-stream water use is not included.
- For water used in closed loop processes (such as cooling system) and in power generation, only the net water consumption (such as reintegration of water losses) should be considered.
- Seawater shall not be included in the indicator.
- Tap water or treated water (e.g. from a water treatment plant), or wastewater that is not directly released in the environment (e.g. sent to a wastewater treatment plant) are not elementary water flows, but intermediate flows from a process within the technosphere.
- Additional transparency in terms of geographical location, type of water resource (e.g. groundwater, surface water), water quality and temporal aspects are voluntary.

Use of Water is reported as Net fresh water use (m^3).

4.3.3 UPSTREAM PROCESSES

The following requirements apply to the upstream processes:

- Data shall be handled as described in **Error! Reference source not found.**.
- Transport of main parts and components along the supply-chain to a distribution point (e.g. a stockroom or warehouse) where the final delivery to the manufacturer can take place should be based on the actual transportation mode, distance from the supplier and vehicle load.
- Electricity production impacts should be accounted for in the priority given in 4.3.1 when specific data is used in the upstream processes. The mix of electricity used in the upstream processes shall be documented, if relevant.

The results for upstream processes shall be declared as a single aggregated information module, A1-3.

4.3.4 CORE PROCESSES

The results of the life cycle inventory of processes within the core module of the life cycle should be available separately for each process but are reported in an aggregated information module, A4-5. The following requirements apply to the core processes:

- **A4 Transport**

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Transports are calculated primarily from the construction products originating from factory and secondarily from the supplier warehouse. The type of transport and transport distance should be representative to actual conditions on the market for which the EPD is valid. The information in *Table 7* shall be provided to specify the transportation scenarios.

Table 7. Module A4 – transport to the building site. Unit expressed per functional unit.

Parameter	**Unit**
Fuel type and consumption of vehicle and vehicle type used for transport e.g. long distance truck, boat etc.	Litre of fuel type per distance or vehicle type, Commission Directive 2007/37/EC (European Emission Standard)
Distance	km
Capacity utilization (including empty returns)	%
Bulk density of transported products	kg/m^3
Volume capacity utilisation factor (factor: =1 or <1 or ≥1 for compressed or nested packaged products)	Not applicable

- **A5 Construction and installation**

Specific fuel consumption data and energy use on the site shall be collected in the life cycle inventory for construction and installation if possible. In addition, data on waste quantities and waste management at the construction site should be collected as well as transports of waste.

If specific information on the use of energy and materials in the building's installation and ground works is missing, a scenario shall be constructed from recognized and accepted calculation means, e.g. technical-economical compilations of construction processes and, if necessary, additional sources. The scenario shall be tailored to the type of building and construction methods. In the final EPD report, a description of the scenario and assumptions shall be reported.

Suppliers and manufacturers should be contacted when necessary. When such data is not available, selected generic data may be used if this is clearly justified and accounted for.

The information in Table 8 shall be provided to specify the construction and installation scenarios.

Table 8. Module A5 – construction and installation on the building site. Unit expressed per functional unit.

Parameter	**Unit**
Ancillary materials for installation (specified by material)	kg or other units as appropriate
Net fresh water use	m^3
Other resource use	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

4.3.5 DOWNSTREAM PROCESSES

The following requirement apply to the downstream processes:

- With regard to data quality requirements for the end-of-life stage based on scenarios, the following shall apply for the information being:

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

- Technically and economically practicable, and
- Compliant with current regulations in the relevant geographical area.

All key assumptions regarding the end-of-life stage shall be documented.

The environmental performance-related information for the downstream processes (B1-B7, C1-C4) shall be presented separated for each information module (B1, B2, C1, C2, etc.). The environmental impact of e.g. Module B1 shall not be summarized with the environmental impact of other processes in the use stage. It is recognised that it may be difficult to separate all use stage processes and the connected aspects and impacts into separate modules. Any deviations shall be transparently reported and justified.

Use stage

- **B1 Material emissions from usage**

The scenario shall define the internal and external conditions for the object of the assessment. These conditions influence the impacts related to the characteristics of the products in their application (e.g. release of substances into the environment depends on pattern of use, humidity, air velocity and temperature).

Data on the pollutant emissions from the use stage should be based on documented tests, verified studies in conjunction with average or typical product use, or recommendations concerning suitable product use. Whenever applicable, test methods shall be internationally recognized.

- **B2 Maintenance**

Table 9. Module B2 - use stage related to the building. Unit expressed per functional unit.

Parameter	**Unit**
Maintenance process	Description or source where description can be found
Maintenance cycle	Number per RSL or year
Ancillary materials for maintenance, e.g. cleaning agent, specify materials	kg/cycle
Waste material resulting from maintenance (specify materials)	kg
Net fresh water consumption during maintenance	m^3
Energy input during maintenance, e.g. vacuum cleaning, energy carrier type, e.g. electricity and amount if applicable and relevant	kWh

- **B3 Repair**

T able 10. Module B3 - use stage related to the building. Unit expressed per functional unit.

Parameter	**Unit**
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 year
Ancillary materials, e.g. lubricant, specify materials	kg or kg/cycle
Waste material resulting from repair (specify materials)	kg
Net fresh water consumption during repair	m^3
Energy input during repair, e.g. crane activity, energy carrier type, e.g. electricity and amount	kWh/RSL, kWh/cycle

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

- **B4 Replacement**

The number of replacements for products, components and elements used in the building is directly linked to its ESL. Only a full number of replacements (no partial replacements) is allowed; in the case of a partial number of replacements resulting from the estimated service life of the component and the reference study period of the building, the value obtained is rounded up; Equation (1) gives the number of replacement(s) N_R (j) for products, components or element j as a function of the required service life of the building (ReqSL).

$$NR\ (j) = E\ [\frac{ReqSL}{ESL(j)} - 1] \qquad (1)$$

Where,

E [ReqSL/ESL (j) is the function that rounds up function ReqSL/ESL (j) to the higher integer value;

ESL (j) is the estimated service life for product j;

N_R (j) is the number of replacements for product j;

ReqSL is the required service life of the building

If, after the last scheduled replacement of a product, the remaining service life of the building is short in proportion to the estimated service life of the installed product, the actual likelihood of this scheduled replacement should be taken into account. The consideration of the likelihood of the replacement shall take into account the required technical and functional performance of the product.

Table 11. Module B4 - use stage related to the building. Unit expressed per functional unit.

Parameter	**Unit**
Replacement cycle	Number per RSL or ESL, or year
Energy input during replacement, e.g. crane activity, energy carrier type, e.g. electricity and amount if applicable and relevant	kWh
Exchange of worn parts during the product's life cycle, e.g. zinc galvanized steel sheet, specify materials	kg

- **B5 Refurbishment**

Table 12. Module B5 - use stage related to the building. Unit expressed per functional unit.

Parameter	**Unit**
Refurbishment process	Description or source where description can be found
Refurbishment cycle	Number per RSL or year
Energy input during repair, e.g. crane activity, energy carrier type, e.g. electricity and amount if applicable and relevant	kWh
Material input for refurbishment e.g. bricks, including ancillary materials for the refurbishment process, e.g. lubricant (specify materials)	kg or kg/cycle
Waste material resulting from Refurbishment (specify materials)	kg
Further assumptions for scenario development e.g. frequency and time period of use, number of occupants	Unit as appropriate

- **B6 Use of energy and B7 Use of Water**

Electricity production impacts should be accounted for in the priority given in 4.3.1 when specific data is used. If generic data is used, the use of the energy mix in the region/country where the building is located and used shall be approximated as the OECD electricity

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

mix. For non-OECD countries, in order to adopt a suitable region- or country-specific electricity mix (reflecting approximately the region(s)/countries' share) a similar precision will be required. The mix shall be documented.

The site-generated energy that is used within the building is assumed to satisfy firstly building-related energy demand and then the energy demand that is not building-related. All energy generating units located within the building's site shall be included in the assessment, including both renewable and non-renewable energy sources (e.g. heat pumps, fuel cells).

The amount of exported energy is reflected in the indicator "Exported energy [MJ]" which is declared in module B6.

Exported energy shall not be deducted from the import of energy required to operate the building. The additional environmental benefits and loads resulting from the exported energy may however be reported in module D according. In case the "current average practice" scenario shall be based on the most likely corresponding energy supply, based on average technology and practice.

Table 13. Modules B6 and B7 - use of energy and use of water. Unit expressed per functional unit.

Parameter	**Unit**
Ancillary materials specified by material	Kg or unit as appropriate
Net fresh water consumption	m^3
Type of energy carrier, e.g. electricity, natural gas, district heating	kWh
Power output of equipment	kW
Characteristics performance, e.g. energy efficiency, emissions, variation of performance with capacity utilization etc.	Unit as appropriate
Further assumptions for scenario development e.g. frequency and time period of use, number of occupants	Unit as appropriate

End-of-life-stage

The amount of waste fractions entering different treatment processes (e.g. one part of a material being recycled and one part being incinerated) shall primarily reflect the circumstances of the studied building and be as specific as possible. As a secondary option, if such data is not available, conservative assumptions may be used but should then be justified and documented.

- **C1 Deconstruction and demolition**

Data for the initial sorting of the demolition waste shall be as accurate as possible to the current situation and the current technologies for the specific region where the building is located. National guidelines or similar for initial sorting of demolition waste may be used if such information not is available.

Existing generic data on the impact of deconstruction and demolition processes may be used if specific data not is available and it complies with Section 4.2. All relevant processes for deconstruction and demolition shall be included and specified by type

- kg collected separately
- kg collected with mixed construction waste

- **C2 Transport**

For any category of materials or products, transportation data should be based on the actual transportation distances and transportation means, including the fuel consumption required. If not available, the average distance transported with a specific means of transportation should be calculated with selected generic data.

- **C3 Waste processing for reuse, recovery or recycling**

The scenarios should describe all preparatory processes for reuse, recycling and energy recovery until the end-of-waste stage is reached. After the end-of waste stage is reached, further processing may also be necessary in order to replace primary materials or fuels (as secondary materials or fuels) in another product system. Such processes are considered beyond the building's system boundaries and are assigned to module D.

Components for re-use and materials for recycling and energy recovery should be documented,

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

- kg for re-use
- kg for recycling
- kg for energy recovery

- **C4 Waste disposal**

The scenarios shall include any processes, or activities e.g. packaging, not covered in C1 to C3 necessary before final disposal, as well as the final disposal as well, and in line with the polluter pays principle.

Product or material for final disposal should be documented,

- kg.

4.3.6 SCENARIOS FOR MODULE D

The net output flow of secondary materials or fuels from the studied product system may substitute primary production, but it may also substitute a mixture of primary and secondary production as well as other secondary production. In this PCR, three different scenarios of impacts associated with material or fuel production, which may be substituted by the secondary materials or fuels should be reported. One scenario should be based on current average practice, e.g. an average mixture of primary and secondary materials or fuels. The other two scenarios may represent substituted primary production and/or the substituted secondary production or similar. The impacts associated with the recycling or recovery processes shall be declared as a positive value whilst the impacts associated with the potential substituted production shall be declared as a negative value.

The net impacts, i.e. the impacts associated with the recycling or recovery process minus the impacts from producing the substituted material or fuel shall not be declared.

5 ALLOCATION

5.1 ALLOCATION FOR MULTIFUNCTIONAL PRODUCTS AND MULTIPRODUCT PROCESSES

In many industrial processes, more than one product is generated in the production process (multi-output process) and one outflow from a process may be generated from several input materials (multi-input process). Allocation is partitioning of input or output flows of a process or other product system to the product system under study.

An allocation problem occurs when a process results in multiple output products and where there is only aggregate information available about the emissions. The priorities suggested by ISO 14040 shall be considered in the procedure definition, however, the method of avoiding allocation by expanding the system boundaries is not applicable within the framework of the International EPD® System due to the rationale of the book-keeping LCA approach (attributional LCA) used and the concept of modularity.

Allocation should be avoided as far as possible by collection of product-specific data. If allocation cannot be avoided, the sum of the allocated inputs and outputs of a unit process shall be equal to the unallocated inputs and outputs of the unit process. The inputs and outputs must be allocated to the different products according to clearly stated procedures that shall be documented and explained.

5.2 REQUIREMENTS REGARDING ALLOCATION OF CO-PRODUCTS

The following decision-hierarchy shall be applied for allocation of multi-input and multi-output processes:

- Allocation shall be avoided as far as possible by dividing the unit process to be allocated into different sub-processes and by collecting the input and output data related to these sub-processes;
- If a process can be divided into different sub-processes but data for the respective sub-process is not available, the inputs and outputs of the system should be partitioned between its different products in a way that reflects their underlying physical relationships, i.e. the product shall only be responsible for the input and output flows it has a physical relation to;
- If a process cannot be divided into sub-processes, the allocation should be based on physical relations, e.g. mass or volume when the difference in revenue from the co-product is low;

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

- In all other cases allocation shall be based on economic value, i.e. allocating the input and output flows according to the economic value (used as reference value) of the products directly after they leave the multi-output process. A sensitivity analysis must be performed in the LCA report.

5.3 REQUIREMENTS REGARDING ALLOCATION PROCEDURES FOR REUSE, RECYCLING

In the framework of the International EPD® System, the methodological choices for allocation for reuse, recycling have been set according to the polluter pays principle (PPP).

If there is an inflow of recycled material to the production system, the recycling process and the transportation from the recycling process to where the material is used shall be included. If there is an outflow of material to recycling, the transportation of the material to the recycling process shall be included. The material going to recycling is then an outflow from the production system as an indicator.

For further information about system boundaries concerning waste, etc., see the General Programme Instructions of the International EPD® System.

When products and materials are recycled or recovered, they become inputs to other product systems. The environmental burden related to the recycling or recovering process is thereby related to the system under study and to the following product system and needs to be allocated between the systems (open-loop allocation).

The system boundary of the building's system is set where the output flows from the system have reached the end-of-waste state. The environmental burden shall be allocated according to the *polluter pays principle*. This principle implies that from the moment a user is willing to pay for a secondary material, this secondary product system will be responsible for the environmental burden from that point on. That means that the generator of the waste has to carry the full environmental impact until the point in the product's life cycle where the waste is transported to a scrap yard or gate of a waste processing plant (collection site). The subsequent user of the waste has to carry the environmental impact from the processing and refinement of the waste, but not the environmental impact caused in the "earlier" life cycles.

If using secondary materials in the production of the building, the building's product system is, as aforementioned, responsible for the associated environmental burden.

Allocation of the environmental burden between several product systems in the way described above is referred to as the cut-off method.

The potential loads and benefits of secondary materials leaving the building's system may be declared in module D.

5.4 REQUIREMENTS REGARDING ALLOCATION PROCEDURE FOR WASTE HANDLING

The treatment processes (final disposal) of wastes generated by the activities included in the system boundaries should be included in the LCA calculation. When it is not possible for some reasons (such as database framework or lack of information), the amount of wastes and the destination shall be declared.

For the purposes of the EPD® preparation, the final disposal processes include:

- Landfilling that has to be attributed to the studied process,
- Incineration. For the calculation of impacts related to incineration with energy recovery the environmental impact of waste destruction shall be attributed to the waste generator and the impacts related to making use of the thermal energy shall be attributed to the next product life cycle. If data are missing, as a default option, 50% of the impacts of the waste incineration plant may be attributed to waste treatment and 50% to the energy recovery. In case of incineration without energy recovery, the product system generating the waste must include 100% of the environmental impacts from incineration.

In case that waste flows are sent to material recycling or energy recovery or other recovery (e.g. composting), impacts should be borne by the product under study until it enters the facility gate where the recycling or recovery processes take place (e.g. transportation to the facility shall be included). Even if benefits related to the material recovery have to be considered out of the system boundaries, an estimation of the avoided impacts due to such recovery could be made and declared separately as additional environmental information. Deviations may be accepted and declared. All the assumption on the inclusion or not of waste treatment processes shall be clearly declared in the EPD.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

For further information about system boundaries concerning waste, etc., see the General Programme Instructions of the International EPD® System.

6 LIFE CYCLE IMPACT ASSESSMENT

6.1 IMPACT INDICATORS

The following potential environmental impacts shall be calculated and reported in the EPD® according to EN15804:

Table 14. Impact indicators that shall be reported in the EPD, in compliance with EN 15804.

Impact Category	**Parameter**	**Unit (expressed per functional unit)**
Depletion of abiotic resources		
- Elements	Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb equiv
- Fossil fuels	Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ, net calorific value
Acidification for soil and water	Acidification potential of soil and water, AP	kg SO_2 equiv[3]
Ozone Depletion	Depletion potential of the stratospheric ozone layer, OPD	kg CFC 11 equiv
Global Warming	Global warming potential, GWP	kg CO_2 equiv
Eutrophication	Eutrophication potential, EP	kg $(PO_4)^{3-}$ equiv
Photochemical ozone creation	Formation potential of tropospheric ozone, POCP	kg Ethene C_2H_4 equiv

Another impact indicator that should be reported is *direct land use and land use change,* which means the change of carbon storage on land, expressed in kg CO_2 equiv.

The characterisation models and factors to use for the default impact categories are available on the website www.environdec.com and are updated on a regular basis based on the latest development in LCA methodology and ensuring market stability of EPDs. The source and version of the characterisation models and factors used shall be reported in the EPD.

Alternative regional LCIA methods with other characterization factors are allowed to be calculated and displayed in addition to the default characterisation factors. The EPD® shall contain a clear explanation to what the difference is between the different sets of indicators, as they may appear to a non-expert to display duplicate information regarding the same environmental impact category. The EPD® or its supplementary materials may provide information about the different environmental impact categories displayed in the EPD, including their global/regional characteristics. Other impact indicators that may be reported separately are:

- Carbon sequestration
- Temporary carbon storage and Delayed emissions
- Emissions of Biogenic Carbon
- Carbonation
- Indirect land use change

[3] Please note that for this indicator a CML non-baseline approach is currently recommended. See www.environdec.com for the latest information.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

- Soil carbon change
- Human toxicity

6.2 IMPACT INDICATOR SELECTION JUSTIFICATION

The impact categories have been included as they constitute the set of indicators required according to EN15804.

6.3 RESULTS

LCA results to be reported in the EPD® are:

- Use of resources
- Potential environmental impacts
- Waste production
- Other environmental indicators

6.3.1 USE OF RESOURCES

The use of resources shall be presented in the EPD® using results from the life cycle inventory. Resources are the elementary flows crossing the system boundary between nature and the studied product system.

The indicators for resource use from the life cycle inventory (except water and air) should be reported under the following headings per functional unit:

Environmental impact category	**Unit**
Use of renewable primary energy excluding primary energy resources used as raw material	MJ, net calorific value
Use of renewable primary energy resources used as raw material	MJ, net calorific value
Use of non-renewable primary energy excluding primary energy resources used as raw material	MJ, net calorific value
Use of non-renewable primary energy resources used as raw material	MJ, net calorific value
Use of secondary material	kg
Use of renewable secondary fuels	MJ, net calorific value
Use of non-renewable secondary fuels	MJ, net calorific value
Use of net fresh water	m^3

Notes:

- To identify the primary energy used as an energy carrier (and not used as raw materials), the parameter may be calculated as the difference between the total input of primary energy and the input of energy resources used as raw materials.
- The energy content of biomass used for feed or food purposes shall not be considered.
- The net use of fresh water does not constitute a “water footprint” as a potential environmental impact because the water use in different geographical locations is not captured. For this indicator:

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

- evaporation, transpiration, product integration, release into different drainage basins or the sea, displacement of water from one water resource type to another water resource type within a drainage basin (e.g. from groundwater to surface water) is included.
- in-stream water use is not included.
- only the net water consumption (such as the reintegration of water losses) of water used in closed-loop processes (such as a cooling system) and in power generation should be considered.
- seawater shall not be included[4]
- tap water or treated water (e.g. from a water treatment plant), or wastewater that is not directly released into the environment (e.g. sent to a wastewater treatment plant) do not count as elementary water flows, but intermediate flows from a process within the technosphere.
- additional transparency in terms of geographical location, type of water resource (e.g. groundwater, surface water), water quality, and temporal aspects may be included as additional information.

See Appendix B, table B3.

6.3.2 POTENTIAL ENVIRONMENTAL IMPACTS

See Section 6.1.

6.3.3 WASTE CATEGORIES AND OUTPUT FLOWS

Waste generated along the whole life cycle of the product shall be handled following the technical specifications described in the General Programme Instructions. When the amount of waste has to be declared, the following information shall be reported:

- Non-hazardous waste (kg),
- Hazardous waste (kg),
- Radioactive waste (kg).

Environmental information describing output flows shall be reported:

- Components for re-use (kg)
- Materials for recycling (kg)
- Materials for energy recovery (kg)
- Exported energy (MJ per energy carrier)

6.4 INTERPRETATION

The LCA report underlying the EPD® should include, as a minimum, a sensitivity analysis of key parameters and a data quality assessment. The results do not have to be included in the EPD, but should be available to the verifier.

The General Programme Instructions recommend that the EPDs include an indicator suitable for demonstrate the share of specific data, selected generic data and proxy data for the environmental impacts.

It is recommended to add interpretation of results in a LCA report.

6.5 ASSUMPTIONS AND LIMITATIONS

The LCA report underlying the EPD® should include key assumptions made and the limitations of the study. The results do not have to be included in the EPD, but should be available to the verifier.

[4] It may be relevant to include seawater if it is used to obtain energy from it, or it is the only source of water in a definite site. This may be displayed separately, e.g. as “seawater for desalinization”.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

6.6 UNCERTAINTY

The LCA report underlying the EPD® may include uncertainty assessment of the results. The results do not have to be included in the EPD, but should be available to the verifier.

7 INSTRUCTIONS FOR PRODUCING AND PROVIDING ADDITIONAL INFORMATION

7.1 PROGRAMME-RELATED INFORMATION

The EPD® shall include the following programme-related information:

- Reference to the International EPD® System and to EPD International AB as the programme operator,
- Reference to www.environdec.com,
- The EPD® logotype,
- The reference PCR document upon which the EPD® is based identified according to registration number, date and CPC codes,
- Registration number (provided by the Secretariat),
- Date of publication and validity. The date of the latest revision should also be provided.
- Declaration of the year(s) covered by the data used for the LCA calculation and other relevant reference years. The main database(s) for generic data and LCA software used may be declared, if relevant,
- Geographical scope of application of the EPD®
- Reference to relevant websites for more information.

7.2 PRODUCT-RELATED INFORMATION

The EPD® shall include the following product and company-related information:

- Product identification by name, trade name and product code (if applicable),
- A simple visual representation or image of the product,
- Identification of the product according to the CPC classification system,
- Identification of the product according to other relevant codes for product classification (if appropriate), e.g. CPV code, the United Nations Standard Products and Services Code® (UNSPSC), Classification of Products by Activity (CPA) or Australian and New Zealand Standard Industrial Classification (ANZSIC),
- Name and contact information of the EPD® owner,
- Manufacturing site and country,
- Functional unit,
- Short description of the underlying LCA-based information (e.g. summary of an existing LCA study or similar studies),

The following information is voluntary to include in the EPD:

- Technical description of the product in terms of functional characteristics, main product components and or materials, expected service life time etc.,
- Description of the intended use of the product,
- Manufacturers logotype,

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

- Short description of the organisation, including information on product or management system related certifications (e.g. ISO 14024 Type I ecolabels, ISO 9001- and 14001-certificates and EMAS-registrations) and environmental policy,
- Other relevant work the organisation wants to communicate (e.g. SA 8000, supply-chain management and social responsibility),

Any claims made about the product must be verifiable.

7.2.1 CERTIFICATIONS

If the building or the construction products are certified according to other systems, it can be declared in this category, e.g. FSC, BREEAM etc.

7.3 CONTENT DECLARATION

See Section 0

7.4 MANDATORY STATEMENTS

The following information is mandatory to include in the EPD:

- Differences versus previous versions of the EPD
- Any omission of life cycle stages not making the EPD® cover the full life cycle, with a justification of the omission,
- Means of obtaining explanatory materials, for example references to chosen methodologies,
- A statement that “EPDs within the same product category but from different programmes may not be comparable”.

The EPD® shall also give the following information about the verification process:

Product category rules (PCR): PCR 2014:02 Buildings, versino 2.0
Product Category Rules (PCR) review was conducted by: *The Technical Committee of the International EPD® System. Review chair: Lars-Gunnar Lindfors* *Contact via info@environdec.com.*
Independent verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☐ EPD verification
Third party verifier: *Name of the third party verifier (accredited certification body or approved individual verifier)* Accredited by: *Name of the accreditation body. For individual verifiers, the text shall be: “Approved by the International EPD® System”*

7.5 REFERENCES

The EPD® shall refer to, if relevant:

- The underlying LCA
- The name, CPC code and version number of the PCR used
- Other documents that verify and complement the EPD®
- Instruction for recycling, if relevant
- The General Programme instructions of the International EPD® System
- Sources of additional information

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

8 GLOSSARY

CO_2	Carbon dioxide
CPC	Central product classification
EPD	Environmental product declaration
GIA	Gross Internal area
ISO	International Organization for Standardization
kg	kilogram
LCA	Life cycle assessment
PCR	Product Category Rules
ReqSl	Required service life
RSL	Reference service life
RSP	Reference study period
SI	The International System of Units
SO_2	Sulphur dioxide
UN	United Nations

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

9 REFERENCE LITERATURE

BREEAM International New construction 2016 manual

CEN (2013), EN 15804:2012+A1:2013, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

EN 15603 - Energy performance of buildings - Overall energy use and definition of energy ratings

EN 15643-1 (2010). Sustainability of construction works - Sustainability assessment of buildings - Part 1: General framework, European Committee for Standardization, Brussels, Belgium.

EN15978:2011 Sustainability of construction works- Assessment of environmental performance of buildings

EPD Folkhem's concept building, S-P-00652, 2015-09-29

Folkhem. (2015). EPD Folkhem's concept building. Retrieved from http://gryphon.environdec.com/data/files/6/11176/epd652_Folkhem-concept-building.pdf

Greenhouse gas protocol – Product life cycle accounting and reporting standard

ISO (2000), ISO 14020:2000, Environmental labels and declarations – General principles

ISO (2006a), ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures

ISO (2006b), ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework

ISO (2006c), ISO 14044: 2006, Environmental management – Life cycle assessment – Requirements and guidelines

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

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

ISO (2013), ISO/TS 14067:2013, Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification and communication

ISO (2014), ISO 14046:2014, Environmental management – Water footprint – Principles, requirements and guidelines

ISO(2014), 6707-1. Buildings and civil engineering works -- Vocabulary -- Part 1: General terms

ISO (2017), 15686-1. Buildings and constructed assets – Service-life planning – Part 1: General principles

Kurkinen, E. N.-A. (2015). Energi och klimateffektiva byggsystem. Miljövärdering av olika stomalternativ. SP Rapport 2015:70.

Larsson, M. E. (2016). Byggandets klimatpåverkan. Livscykelberäkning av klimatpåverkan för ett nyproducerat energieffektivt flerbostadshus med massiv stomme av trä. Sveriges Byggindustrier.

LEED Reference guide Design and Construction V4

Miljöbyggnad version 2.2 (dated 141001), Sweden Green Building Counsel

PAS 2050:2011 - Specification for the assessment of the life cycle greenhouse gas emissions of goods and services

PCR UN CPC 387: Prefabricated Buildings (version 1.0 dated 2013-01-24, published by the International EPD® System)

PCR 2014:02 Buildings, version 1.0

Peñaloza, D. N. (2013). Life Cycle Assessment of Different Building Systems: The Wälludden Case Study. SP Report 2013:07.

Pousette, A. N. (2014). LCA för vägbro. Analys av en byggd betongöverbyggnad och en alternativ träöverbyggnad. SP Rapport 2014:73.

Tyréns. (2012). Screening avseende klimatpåverkan från flerbostadshus. En studie av Folkhems projekt Kv. Strandparken.

Tyréns. (2015). Jämförande LCA screening varuhus.

Tyréns. (2016). Jämförande LCA för industribyggnad.

Wbcsd, W. &. (2011). Greenhouse Gas Protocol Product Life Cycle Accounting and reporting Standard.

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

10 VERSION HISTORY OF PCR

VERSION 1.0, 2014-02-06

Original version published.

VERSION 2.0, 2018-01-24

- Compliance with to the General Programme Instructions, Version 2.5.
- Use of the latest template for PCR Basic Modules, 2.5
- The system boundary for the core model now explicitly excludes research activities and business travel by personnel.
- Specification for GWP calculation added from General Programme Instructions
- New unit for the functional unit: GIA instead of A_{temp}

VERSION 2.01, 2019-09-06

- Clarified terms of use
- Editorial changes

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

APPENDIX A: CONTENT OF EPD®

As a general rule the EPD® content shall be in line with the requirements and guidelines in ISO 14020 and:

- Must be verifiable;
- Must not include rating, judgements or direct comparison with other products.

This requirement applies also to images in the EPD as pictures, especially on the cover page, could in themselves be interpreted as an environmental claim. Images such as trees, mountains, wildlife that are not related to the declared products should be used with caution and in compliance with national legislation and best available practices in the markets in which it will be used.

EPD®s can be published on several languages, but if the EPD® document is not available in English, the organisation shall provide a summary in English including the main content of the EPD® to be available on www.environdec.com.

The EPD® cover page (if existent) shall as a minimum include relevant information about the product, such as name and an image, the EPD® logotype and date of publication and validity.

The EPD® shall contain the following parts:

- Cover page (voluntary)
- Programme-related information
- Product-related information
- Content declaration
- Environmental performance-related information
  - Use of resources
  - Potential environmental impacts
  - Waste production
  - Other environmental indicators
- Additional environmental information
- Mandatory statements
- References
- Executive summary in English (in case the full EPD® is only published in another language

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

APPENDIX B: TABLES FOR ENVIRONMENTAL INFORMATION

Table B1. Table of results – environmental impacts.

Environmental impact category	**Unit**	**Module A1 to A5**		**Module B1 to B7 Use**							**Module C1 to C4 End-of-life**				**Module D Potential loads and benefits beyond the system boundaries**			
		Production A1-3	Construction A4-5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction demolition	C2 Transport	C3 Waste processing	C4 Disposal	Impacts from recycling recovery/processes	Scenario 1	Scenario 2	Scenario 3
Global warming potential (GWP 100)	kg CO_2 equiv																	
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 equiv																	
Acidification potential of soil and water (AP)	kg SO_2 equiv																	
Eutrophication potential (EP)	kg $(PO_4)^{3-}$ equiv																	
Formation potential of tropospheric ozone (POCP)	kg ethene equiv																	
Depletion of abiotic resources-elements (ADP-elements)	kg Sb equiv																	
Depletion of abiotic resources- fossil fuels (ADP-fossil fuels)	MJ, net calorific value																	

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table B1b. Table of results – environmental impacts per GIA and functional building type according to section 1.2.3.

Environmental impact category	**Unit**	**Module A1 to A5**		**Module B1 to B7 Use**							**Module C1 to C4 End-of-life**				**Module D Potential loads and benefits beyond the system boundaries**			
		Production A1-3	Construction A4-5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction demolition	C2 Transport	C3 Waste processing	C4 Disposal	Impacts from recycling recovery/processes	Scenario 1	Scenario 2	Scenario 3
Global warming potential (GWP 100)	kg CO_2 equiv/GIA																	
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 equiv/GIA																	
Acidification potential of soil and water (AP)	kg SO_2 equiv/GIA																	
Eutrophication potential (EP)	kg $(PO_4)^{3-}$ equiv/GIA																	
Formation potential of tropospheric ozone (POCP)	kg ethene equiv/GIA																	
Depletion of abiotic resources-elements (ADP-elements)	kg Sb equiv/GIA																	
Depletion of abiotic resources- fossil fuels (ADP-fossil fuels)	MJ, net calorific value/GIA																	

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table B2. Table of results – waste categories and output flows.

Environmental impact category	Unit	Module A1 to A5		Module B1 to B7 Use							Module C1 to C4 End-of-life			
		Production A1-3	Construction A4-5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction demolition	C2 Transport	C3 Waste processing	C4 Disposal
Waste categories														
Non-hazardous waste to disposal	kg													
Hazardous waste to disposal	kg													
Output flows														
Components for reuse	kg													
Material for recycling	kg													
Material for energy recovery	kg													
Exported energy	MJ													

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table B2b. Table of results – waste categories and output flows per GIA and functional building type according to section 1.2.3.

Environmental impact category	Unit	Module A1 to A5		Module B1 to B7 Use							Module C1 to C4 End-of-life			
		Production A1-3	Construction A4-5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction demolition	C2 Transport	C3 Waste processing	C4 Disposal
Waste categories														
Non-hazardous waste to disposal	kg/GIA													
Hazardous waste to disposal	kg/GIA													
Output flows														
Components for reuse	kg/GIA													
Material for recycling	kg/GIA													
Material for energy recovery	kg/GIA													
Exported energy	MJ/GIA													

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table B3. Table of results – resource use.

Environmental impact category	Unit	Module A1 to A5		Module B1 to B7 Use							Module C1 to C4 End-of-life			
		Production A1-3	Construction A4-5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction demolition	C2 Transport	C3 Waste processing	C4 Disposal
Use of renewable primary energy excluding primary energy resources used as raw material	MJ, net calorific value													
Use of renewable primary energy resources used as raw material	MJ, net calorific value													
Use of non-renewable primary energy excluding primary energy resources used as raw material	MJ, net calorific value													
Use of non-renewable primary energy resources used as raw material	MJ, net calorific value													
Use of secondary material	kg													
Use of renewable secondary fuels	MJ, net calorific value													
Use of non-renewable secondary fuels	MJ, net calorific value													
Use of net fresh water	m^3													

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table B3b. Table of results – resource use per GIA and functional building type according to section 1.2.3.

Environmental impact category	Unit	Module A1 to A5		Module B1 to B7 Use							Module C1 to C4 End-of-life			
		Production A1-3	Construction A4-5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction demolition	C2 Transport	C3 Waste processing	C4 Disposal
Use of renewable primary energy excluding primary energy resources used as raw material	MJ, net calorific value/GIA													
Use of renewable primary energy resources used as raw material	MJ, net calorific value/GIA													
Use of non-renewable primary energy excluding primary energy resources used as raw material	MJ, net calorific value/GIA													
Use of non-renewable primary energy resources used as raw material	MJ, net calorific value/GIA													
Use of secondary material	kg/GIA													
Use of renewable secondary fuels	MJ, net calorific value/GIA													
Use of non-renewable secondary fuels	MJ, net calorific value/GIA													
Use of net fresh water	m^3/GIA													

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table B4. Table of results – additional GHG emissions and removals.

Environmental impact category	**Unit**	**Module A1 to A5**		**Module B1 to B7 Use**							**Module C1 to C4 End-of-life**			
		Production A1-3	Construction A4-5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction demolition	C2 Transport	C3 Waste processing	C4 Disposal
Additional GHG emissions and removals														
Carbon sequestration	kg CO_2 equiv													
Emissions of biogenic carbon	kg CO_2 equiv													
Direct land use change	kg CO_2 equiv													

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table B4b. Table of results – additional GHG emissions and removal per GIA and functional building type according to section 1.2.3.

Environmental impact category	**Unit**	**Module A1 to A5**		**Module B1 to B7 Use**							**Module C1 to C4 End-of-life**			
		Production A1-3	Construction A4-5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction demolition	C2 Transport	C3 Waste processing	C4 Disposal
Additional GHG emissions and removals														
Carbon sequestration	kg CO_2 equiv/GIA													
Emissions of biogenic carbon	kg CO_2 equiv/GIA													
Direct land use change	kg CO_2 equiv/GIA													

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table B5. Table of results - Optional environmental information.

Environmental impact category	**Unit**	**Module A1 to A5**		**Module B1 to B7 Use**							**Module C1 to C4 End-of-life**			
		Production A1-3	Construction A4-5	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction demolition	C2 Transport	C3 Waste processing	C4 Disposal
Optional environmental information														
Carbonation	kg CO_2 equiv													
Indirect land use change	kg CO_2 equiv													
Soil carbon change	kg CO_2 equiv													
Certifications														
Human and ecological toxicity														
Biological diversity														
Others														

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

Table B5b. Table of results - Optional environmental information per GIA and functional building type according to section 1.2.3.

Environmental impact category	**Unit**	**Module A1 to A5**		**Module B1 to B7 Use**							**Module C1 to C4 End-of-life**			
		Production A1-3	Construction A4-5	B1 Use	Production A1-3	Construction A4-5	B1 Use	Production A1-3	Construction A4-5	B1 Use	Production A1-3	Construction A4-5	B1 Use	Production A1-3
Optional environmental information														
Carbonation	kg CO_2 equiv/GIA													
Indirect land use change	kg CO_2 equiv/GIA													
Soil carbon change	kg CO_2 equiv/GIA													
Certifications														
Human and ecological toxicity														
Biological diversity														
Others														

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

BUILDINGS
PRODUCT CATEGORY CLASSIFICATION: UN CPC 531

© EPD INTERNATIONAL AB 2019. ALL USE IS SUBJECT TO OUR GENERAL TERMS OF USE PUBLISHED AT WWW.ENVIRONDEC.COM

© 2019 EPD INTERNATIONAL AB

YOUR USE OF THIS MATERIAL IS SUBJECT TO THE GENERAL TERMS OF USE PUBLISHED ON BY EPD INTERNATIONAL AB:S HOMEPAGE AT HTTPS://WWW.ENVIRONDEC.COM/CONTACT/GENERAL-TERMS-OF-USE/. IF YOU HAVE NOT REGISTERED AND ACCEPTED EPD INTERNATIONAL AB:S THE GENERAL TERMS OF USE, YOU ARE NOT AUTHORIZED TO EXPLOIT THIS WORK IN ANY MANNER

COVER IMAGE: © ISTOCKPHOTO.COM / NAMATAE