

PRODUCT CATEGORY RULES (PCR)

For preparing an Environmental Product
Declaration (EPD) for Product Category

North American Structural and Architectural Wood Products

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NPCR 015 September 2009, The Norwegian EPD Foundation
and
PCR Wood Materials November 2009, Institut Bauen und Umwelt e.V. (IBU)

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General Information

This Product Category Rules (PCR) document is intended for companies preparing an Environmental Product Declaration (EPD) for North American structural and architectural wood products (see Chapter 5.3 for definition of product category). The users of this PCR will be manufacturers of North American structural and architectural wood products and other interested parties. This PCR has been developed under the General Program Instructions for the FPInnovations' EPD Program on Wood Building Products, prepared by FPInnovations, December 1, 2010. The PCR presents a structure that is intended to ensure a harmonious approach is taken to derive, verify and present EPDs for solid wood products.

This PCR is consistent with and complies with the mandatory requirements contained within the following ISO standards:

- ISO 21930: 2007, Building construction - Sustainability in building construction Environmental declaration of building products
- ISO 14025: 2006, Environmental labeling and declarations – Type III environmental declarations – Principles and procedures
- ISO 14044: 2006, Environmental management — Life cycle assessment —Requirements and guidelines
- ISO 14040:2006, Environmental management – Life Cycle Assessment –Principles and Framework.

The Norwegian EPD Foundation PCR NPCR 015, on which this PCR is based, focused on Life Cycle Assessment (LCA) studies of wood products carried out in the project *Nordic Wood* (1999), and in the project MIKADO (2007-2009). This PCR also borrows from the German Institute for Construction and Environment's (IBU) wood materials PCR released in November 2009. LCAs of solid wood products conducted by various organizations in North America over the past ten years also helped to shape this PCR.

These European PCRs have been adapted for use in North America. The changes reflect:

- terminology changes to be consistent with North American language;
- more rigorous cut-off rules in recent North American LCAs on which this PCR is based;
- practice regarding allocation in recent North American LCAs on which this PCR is based;
- use of the Tools for the Reduction and Assessment of Chemical and other environmental Impacts (TRACI) system for impact measure characterization factors for North American LCA; and
- a modified list of wood products relevant to this PCR.

Program operator: FPInnovations, a not-for-profit organization that works towards optimizing the forest sector value chain. It capitalizes on Canada's fibre attributes and it develops new products and market opportunities within a framework of environmental sustainability.

The PCR has been prepared by: FPInnovations with consulting support from the Athena Sustainable Materials Institute. Members of the PCR Review Panel:

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1. Scope

The intended application of this Product Category Rules (PCR) document is to give a set of specific rules, requirements and guidelines for developing Environmental Product Declarations (EPD) for solid wood products and to specify the underlying requirements of the LCA. This PCR is valid for solid wood products and provides requirements for both Business-to-Business (BtoB) EPDs as well as Business-to-Consumer (BtoC) EPDs.

2. Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6707-1, ISO 14001, ISO 14025, ISO 14040, ISO 14050 and ISO 21930 apply.

3. Period of validity of the document

This document is valid until April 2014 (3 years).

4. Informed comparison

It shall be stated in EPDs created under this PCR that cradle-to-grave LCA results in a relevant EPD can be used for comparison between different EPDs provided products and systems have been assessed on the basis of the same function, quantified by the same functional unit in the form of their service life reference flows. Cradle-to-gate information modules using a declared unit shall not be used for comparisons.

5. Company/organization, product and product category

5.1 Description of company/organization

The name of the company/organization as well as the place(s) of production shall be provided. General information about the company/organization can be included in the EPD i.e. the existence of quality systems or environmental management system according to ISO 14001 or any other environmental management system in place.

5.2 Description of product

The description of the product shall enable the user to identify the product unambiguously. The characterization includes:

- product identification by name and other relevant identifiers as appropriate, and a simple visual representation of the building product for which the EPD is developed;
- intended use of the product,
- flow diagram of main production processes according to the scope of the EPD; and materials and substances to be declared.

Material contents of the finished product, including packaging shall be declared in terms of the main components. Substances officially classified as hazardous according to national and international regulations such as Controlled Products Regulations (SOR/88-66) shall be stated. Product specific data that is confidential, because of competitive business environment, intellectual property rights or similar legal restrictions need not be declared to the public.

5.3 Definition of product category

This PCR addresses the primary products shown in Table 1 and secondary products made from those products.

Table 1 Products covered by this PCR

Product	Reference standard for definition
Lumber (timber)	ASTM D9-09ae1
Glued-laminated timber (glulam)	ASTM D9-09ae1
Laminated veneer lumber (LVL)	ASTM D9-09ae1
Finger-jointed lumber	ASTM D9-09ae1
Structural composite lumber	ASTM D9-09ae1
Battens	ASTM D9-09ae1
Molding	ASTM D9-09ae1
Pre-fabricated wood I-joist	ASTM D9-09ae1
Shakes	ASTM D9-09ae1
Shingles	ASTM D9-09ae1
Plywood	ASTM D1038-83(2005)
Oriented strand board	ASTM D1554-10
Medium-density fiberboard	ASTM D1554-10
Particleboard	ASTM D1554-10
Veneer	ASTM D1038-83(2005)

This PCR is not valid for furniture or case goods. This PCR is not valid for wood products processed or treated with preservatives or fire retardants.

6. Goal and scope for the underlying LCA

6.1 Functional and declared unit

This PCR is valid for all wood products that are manufactured or processed for incorporation in a building or other construction work. (i.e. building materials, products, components, or building elements), among other uses. The functional unit or declared unit of a product provides the quantitative normalization for comparing products of equivalent function. For EPDs covering the complete life cycle a functional unit is defined. For EPDs not covering the complete life cycle, e.g. leaving out the use stage and/or the end of life stage, a declared unit is defined. If the intended use of the EPD is for comparison purposes between different building products, the use and end-of- life stages must be included. In such situations the functional unit shall be used, not the declared unit.

The declared unit shall be 1 cubic meter of wood materials. The functional unit shall be one of the following as appropriate: cubic meters of installed product, square meters of installed product (with a

stated product thickness), square meters of constructed area using the product or other unit as appropriate. Explanation of the selected functional unit shall be stated clearly including service life.

6.2 System boundaries

Cradle-to-Gate or “Information Module” (BtoB EPDs)

The life cycle activities shall include:

- extraction (removal) of raw materials
- transport of raw materials from extraction site or source to manufacturing site (including any recovered materials from source to be recycled in the process)
- manufacturing of wood product
- packaging

Cradle-to-Grave (Mandatory for BtoC EPDs)

A complete cradle-to-grave LCA shall be developed for each product. The life cycle activities shall include resource extraction through product use for a specified service life, inclusive of maintenance and replacement and end-of-life effects.

The system boundary for a “Cradle-to-Grave” LCA will include the average transportation of major inputs to (and within) each activity stage including the shipment of products to building site locations by common modes as well as average transportation to a landfill or other disposition at the end of the service life for each application.

Any site-generated energy and purchased electricity is included in the system boundary. The extraction, processing and delivery of purchased primary fuels, e.g., natural gas and primary fuels used to generate purchased electricity, must also be included within the boundaries of the system. Purchased electricity consumed at various site locations should be modeled to come from a specified North American grid.

The system boundaries encompass the following processes:

Production stage

- extraction of raw materials
- average transportation of raw materials (including recycled materials) from extraction site or source to manufacturing site (including any recovered materials from source to be recycled in the process)
- manufacturing of wood product
- packaging
- average transportation from production site to recycling/reuse/landfill (wastes and unutilized by-products from manufacturing)
- recycling/reuse/energy recovery (waste and by-products from production)

Construction stage

- average transportation of building products from production site to building site
- installation on the building site
- waste on the building site

Use stage

The use stage is treated as a typical scenario, which shall be described in detail:

- the reference service life shall be declared and the maintenance and number of replacements of the wood products shall be declared accordingly (note that a 60-year service life is an accepted time period to use for structural products being used in “permanent building”)
- includes any maintenance/replacement of the wood products required to attain the expected reference service life; and
- maintenance/replacements are to be modeled according to manufacturers’ guidelines.

End-of-life stage

The end-of-life stage is treated as a typical scenario, which shall be described in detail:

- dismantling/demolition;
- transport from building site to recycling/reuse/landfill; and
- recycling/reuse/energy recovery/decomposition

All end-of-life assumptions shall be described in detail.

Production, installation, use and end-of-life stages shall be declared separately.

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

The Life Cycle stages for installed solid wood products are shown in Figure1 on the following page.

6.3 Description of data

The use of specific or generic background data shall be documented. As a rule the following distribution will be applied:

- production of raw materials (specific and/or average background);
- manufacturing of the product (specific);
- the mix of electricity (calculation procedure) shall be documented; and
- hazardous waste shall be specified according to regulations such as Federal Hazardous Waste Regulations and the Canadian Environmental Protection Act, 1999.

For generic data, national databases shall be used to the extent that they are applicable (e.g., U.S Life Cycle Inventory Database www.nrel.gov/lci).

All data sources have to be specified, including database and year of publication (reference). Sources of data for transport models (including transport form, distances and quantities to be transported) and thermal energy production shall be documented.

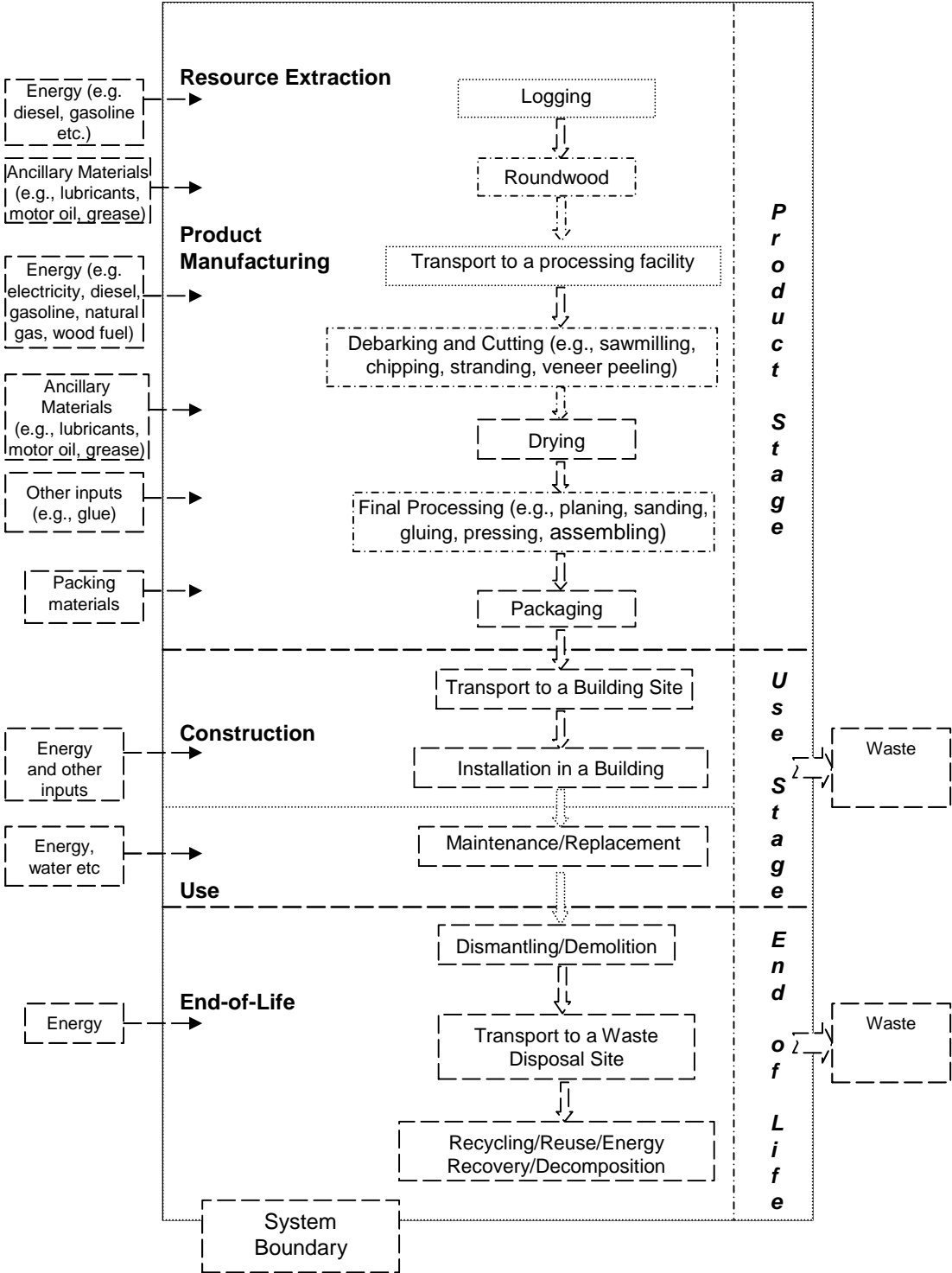
6.4 Cut-off rules

The cut-off criteria for input flows to be considered within each system boundary are as follows:

a) Mass – if a flow is less than **1%** of the cumulative mass of the model flows it may be excluded, providing its environmental relevance is minor.

b) Energy – if a flow is less than 1% of the cumulative energy of the system model it may be excluded, providing its environmental relevance is minor.

Figure 1 Life cycle stages for wood products



c) Environmental relevance – if a flow meets the above two criteria, but is determined (via secondary data analysis) to contribute **2%** or more to the selected impact categories of the products underlying the EPD, based on a sensitivity analysis, it is included within the system boundary.

A list of hazardous and toxic materials and substances shall be included in the inventory and the cut-off rules do not apply to such substances.

6.5 Data Quality requirements

Any secondary data source used in the underlying life cycle inventory shall be complete and representative of North America in terms of its geographic and technological coverage and be of a recent vintage, typically less than ten years old. Any deviations from these initial data quality requirements for secondary data shall be documented.

6.6 Units

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

- kWh (MJ) for electric energy
- kW (MW) for power

Table 2 Conversion factors to be used if reporting in IP units (Imperial)

Convert from	To	Multiply by
square meter (m ²)	Square foot (ft ²)	1.076391E+01
kilogram (kg)	Pound (lb)	2.204622E+00
Mega joule (MJ)	British Thermal Unit (BTU)	9.478170E+02
degree Celsius (°C)	degree Fahrenheit (°F)	t/°C = (t/°F - 32)/1.8
cubic meter (m ³)	cubic foot (ft ³)	3.531466E+01
meter (m)	foot (ft)	3.281E+00
m ² K/W	ft ² Fhr/Btu	5.6783E+00

Source: NIST: <http://physics.nist.gov/Pubs/SP811/appenB9.html>

7. Inventory analysis

7.1 Data collection

The data shall be representative according to temporal, geographical and technological requirements.

- **Temporal:** The obtained information from the manufacturing process should be annual approximate values and updated, i.e., from the previous 12-month period. Average background data shall not be older than 10 years.
- **Geographical:** The geographic region of the relevant life cycle stages included in the calculation of representative data shall be documented.
- **Technological:** Data shall represent technology in use.

7.2 Calculation rules

In the case of BtoC EPDs, the amount of material used as input to enable wood products to meet the functional unit requirements shall include related accessories and other materials (e.g., fasteners). Omission of accessories and other materials shall be justified.

7.3 Allocation rules

In a production process where more than one type of product is generated, it is necessary to allocate the environmental impacts (inputs and outputs) from the process to the different products in order to get product-based inventory data. In principle allocation rules should reflect the goal of the production process.

Allocation shall follow the guidance of ISO 14044:2006-07, clause 4.3.4, and the following.

- Allocation of multi-output processes shall be based on mass. However, if economic value is ten times greater between products from a multi-output process, a suitable revenue based allocation principle shall be applied and these deviations shall be substantiated and readily available for review.
- Allocation of multi-input processes shall be based on the physical composition of the inputs and stoichiometry of the reaction. If allocation based on the physical composition and stoichiometry of the inputs is not possible, another allocation principle based on physical and chemical properties shall be applied and declared.
- Allocation for recycling processes shall be based on the current plant (industry)-specific situation inclusive of the system limits of collected recycled materials, or on another supportable physical or economic value basis.

Raw material energy shall be allocated to material resources (kg), while process energy shall be allocated to energy resources (MJ).

Allocation related to transport shall be based on the weight [ton(ne) km] of transported product.

When the product's original function is lost, it can be processed further in a waste management system, e.g. it can be recycled, reused or energy recovered. The emissions from downstream combustion will be allocated to the new downstream products, i.e. heat and electricity, according to the allocation procedure for open loop recycling. In the case of incineration of wood residues or wastes for energy production at the primary production site, the emissions from the combustion shall, however, be allocated to the product.

Recycling processes shall be treated as closed loop recycling, as long as no change occurs in the inherent properties of the recycled material. In such cases, the need for allocation is avoided since the use of secondary material displaces the use of virgin (primary) materials.

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

8. Impact categories and characterization factors

8.1 Characterization factors

The factors employed to calculate the selected environmental impacts shall be taken from Table 3 below:

Table 3 Characterization factors

Impact category	Unit	Source
Global Warming Potential	[kg CO ₂ equiv]	US EPA TRACI (Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts) adjusted to reflect CO ₂ from air captured in the product (see Section 8.3).
Acidification Potential	[moles H ⁺ equiv]	
Eutrophication Potential	[kg N equiv]	
Smog Creation Potential	[kg NO _x equiv]	
Ozone Depletion Potential	[kg CFC-11 equiv]	
		http://www.epa.gov/nrmrl/std/sab/traci/index.html

8.2 Parameters to be reported

Parameters to be reported shall conform to ISO 21930:2007, section 8.2.

The use of resources and energy should be declared as:

- Depletion of non-renewable material resources other than primary energy
- Use of renewable material resources other than primary energy
- Use of renewable energy resources, primary energy, hydropower, wind power, solar power and biomass
- Use of non-renewable energy resources

Note, the heat value of the wood product itself (feedstock energy, renewable) should be reported separately from other renewable primary energy on a higher heating value (HHV) basis.

Environmental impact should be declared as the following using the TRACI formulations as per table 3 above.

- Global Warming Potential (greenhouse gases)
- Potential depletion of the stratospheric ozone layer
- Potential acidification of land and water sources
- Potential eutrophication
- Potential formation of tropospheric ozone (smog)

Waste should be declared as hazardous and non-hazardous.

8.3 Treatment of Biogenic Carbon

It is acknowledged that wood products, their production and final disposition result in various fluxes of biogenic CO₂ to and from the atmosphere. The appropriate methodology to account for these biogenic fluxes within the Global Warming Potential (GWP) impact indicator is as follows:

- the carbon contained in the declared or functional wood product unit (on a CO₂ equivalent mass basis) is deemed an initial sink with a GWP characterization factor of (-1); and
- all biogenic CO₂ emissions (releases to the environment) throughout the modeled product system (BtoB: cradle-to-gate or BtoC: cradle-to-grave) are deemed a source with a GWP characterization factor of (1).

Forest residuals and soil carbon fluxes are excluded from the GWP characterization methodology. For purposes of illustration a detailed carbon balance at various stages throughout the life cycle of the wood materials may be reported on a CO₂ equivalent mass basis.

For transparency and illustrative purposes a second GWP result may be reported for all fossil sources of greenhouse gases (GWP - fossil), which is a subset of the calculated GWP.

9. Additional environmental information

A Type III environmental declaration shall include, where relevant, additional information related to environmental issues, other than the environmental information derived from LCA, LCI or information modules. This information shall be separated from the information described in ISO 14025, 7.2.2.

Identification of the significant environmental aspects can take into consideration the following:

- a) information on environmental issues, such as
 - 1) impact(s) and potential impact(s) on biodiversity,
 - 2) toxicity related to human health and/or the environment, and
 - 3) geographical aspects relating to any stages of the life cycle (e.g. a discussion on the relation between the potential environmental impact(s) and the location of the product system);
- b) data on product performance, if environmentally significant;
- c) the organization's adherence to any environmental management system, with a statement on where an interested party may find details of the system;
- d) any other environmental certification program applied to the product and a statement on where an interested party may find details of the certification program;
- e) other environmental activities of the organization, such as participation in recycling or recovery programs, provided details of these programs are readily available to the purchaser or user and contact information is provided;
- f) information that is derived from LCA but not communicated in the typical LCI or LCIA based formats;
- g) instructions and limits for efficient use;
- h) hazard and risk assessment on human health and the environment;
- i) information on absence or level of presence of a material in the product that is considered of environmental significance in certain areas [see ISO 14021:1999, 5.4 and 5.7 r)];
- j) preferred waste management option for used products;
- k) potential for incidents that can have impact(s) on the environment; and
- l) conformance with a sustainable forest management program.

Additional environmental information shall only be related to environmental issues. Information and instructions on product safety unrelated to the environmental performance of the product shall not be part of a Type III environmental declaration.

10. EPD Supporting Data

Information shall be made available to verifier in order to demonstrate that the requirements of ISO 21930 “Environmental declaration of building products” have been met. This includes documentation on:

- the input and output environmental data of the unit processes that are used for the LCA calculations;
- the documentation (measurements, calculations, estimates, sources, correspondence, traceable references to origin, etc) that provides the basis from which the process data for the LCA is formulated;
- the specification used to create the manufacturer's products;
- energy consumption figures;
- emission data to air, water and soil;
- waste production;
- data that demonstrates that the information is complete. In specific cases, reference can be made to, for instance, standards or quality regulations;
- referenced literature and databases from which data have been extracted;
- documentation that demonstrates that the products can fulfill the desired function(s) and performance;
- documentation that demonstrates that the chosen processes and scenarios in the flow chart satisfy the requirements set in ISO 21930;
- documentation that substantiates the chosen life cycle of the products;
- the documentation and substantiation of the percentages or figures used for the calculations in the waste scenario;
- documentation and substantiation of the percentages and figures (number of cycles, prices, etc.) used for the calculations in the allocation procedure;
- information showing how averages of different reporting locations have been calculated in order to obtain generic data;
- documentation used to substantiate any qualitative information in the additional environmental information;
- procedures used to carry out the data collection (questionnaires, instructions, informative material, confidentiality agreements, etc.);
- the characterization factors, and normalization factors used;
- the criteria and substantiation used to determine the system limits and the selection of input and output flows; and
- documentation used to substantiate the other choices and assumptions

11. Content of the Environmental Product Declaration (EPD)

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

- the name and address of the manufacturer(s);
- product identification by name (including e.g. production code) and a simple visual representation of the product;
- the description of the product’s use and the functional or declared unit of the product to which the data relates;

- the description of the application (installation) of the product where relevant;
- a detailed list of the substances, by weight, that make up the product;
- additional environmental information;
- a statement of whether the EPD is cradle to gate or cradle to grave;
- a statement that EPDs from different programs may not be comparable;
- a statement that the EPD represents an average performance, in such cases where an EPD declares an average performance for a number of products. In addition the standard deviation of the products' performance with respect to the average is stated;
- information on where explanatory material may be obtained;
- a diagram of the life cycle stages included in the LCA subdivided into product stage, building stage and end of life stage, and system boundaries;
- a description of the nature of the processes and ancillary materials that are required for installing the building product in the building works and their replacement and maintenance according to the cut-off criteria;
- name of the program and the program operator's address and, if relevant, the logo and website URL;
- identification of the PCR that the EPD is based on;
- the date the EPD was issued and period of validity;
- the site(s), manufacturer or group of manufacturers or those representing them for whom the results of the LCA are representative;
- name of PCR review panel Chair;
- whether the independent review of the EPD and data was conducted by an internal or external verifier (3rd party verification is mandatory for BtoC EPDs);
- name, address, phone number, fax number, e-mail of the third party verifier and logo of the verification body, if applicable; and
- ISO 14025:2006, 9.2.2 states that, "Type III environmental product declarations intended for business-to-consumer communication shall be available to the consumer at the point of purchase.