PRODUCT-CATEGORY RULES (PCR)

For preparing an environmental declaration (EPD) for Product Group

Building boards

Not finished

PCR 2006:3

Content

1. Introduction

These product category rules (PCR) are intended for companies that are in the process of validating an Environmental Product Declaration (EPD) to cover all environmental aspects for the declaration of building boards. The PCR will be valid for all building boards according to the standards shown in 2.2.

The PCR complies with the ISO standards, ISO 21930, Building construction - Sustainability in building construction – Environmental declaration of building products [1] and the requirements of ISO 14025, Environmental labelling and declarations – Type III environmental declarations – Principles and procedures [2] and the provisions in ISO 14044, Environmental management — Life cycle assessment — Requirements and guidelines [3].
The EPD will present data that has been aggregated over the life cycle stages "Product stage", "Construction stage", "Building stage" and "End of life stage" or relevant portions of it.
Any EPD following these PCR may also be based on information modules that only partially cover all of the stages of the product's Life Cycle. However while the EPD is intended to be used for comparison based on the product's application in a building, comparison of the EPD without consideration of the use stage in the context of a building is not valid.

Program operator:
Næringslivets Stiftelse for Miljødeklarasjoner
NHO, Postboks 5250 Majorstuen,
0303 Oslo

The PCR has been prepared by the members of the PCR WG and SINTEF Byggforsk.

Members of the PCR WG (building boards):

Helge Haaland	Byggma ASA
Lars Harald Nilsen	Hunton Fiber AS
Hans Kristian Eig	Forestia AS
Odd Fagervold	Arbor-Hattfjelldal AS
Vidar Olsen, Terje Østhagen	Norgips Norge AS
Jon Gjerløw	Gyproc AS
Tor Unneberg	Steni AS
Tor Gunnar Bartnes	Alloc AS
Audhild Bø	Dynea AS

Consultant:

Sverre Fossdal	SINTEF Byggforsk AS

1.1 Period of validity of the document

The validity of this document is extended until January 2010 (3 years). When new requirements concerning use of chemicals will be implemented (REACH directive) this PCR may need to be revised.

2. Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
declared unit
quantity of a building product for use as a reference unit in an **EPD** (2.6), based on **LCA** (2.4), for the expression of environmental information needed in **information modules** (2.3)

Example: Mass (kg), Volume (m^3)
[ISO 21930]

2.2
functional unit
quantified performance of a product system for a building product for use as a reference unit in an **EPD** (2.6) based on **LCA** (2.4)
[ISO 21930]

2.3
information module
compilation of data to be used as a basis for a **Type III environmental declaration** (2.6), covering a unit process or a combination of unit processes that are part of the life cycle of a product
[ISO 21930]

2.4
life cycle assessment (LCA)
compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle
[ISO 14040]

2.5
L/S ratio
ratio between the total amount of liquid (L in liter), which is drained from the dry mass (S in kg of dry matter) abbreviated L/S and expressed in l/kg

Note: Adapted from ISO 12457-3

2.6
product category
group of building products that can fulfill equivalent functions
[ISO 21930]

2.7
Type III environmental declaration, Environmental product declaration, EPD
environmental declaration providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information
[ISO 21930]

3. Description of company/organization and product

3.1 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 EMAS or any other environmental management system in place [4], [5].

3.2 Description of product:

The description of the product shall enable the user to identify the product unambiguously. It should include:

- Product identification by name (including e.g. production code) and a simple visual representation of the building product for which the EPD is developed;
- Main technical data and properties of building boards according to NS-EN 13986,[6] NS-EN 13329 [7] NS-EN 13329 [8] NS-EN 438 [9] NS-EN 685 NS-EN 520 [10] NS-EN 622 1-4 [11] NS-EN 312 [12];
- Flow diagram of main production processes according to the scope of the declaration;
- 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 by CAS-No (EU directive 67/548/EWG) shall be stated. Product specific data that is confidential, because of competitive business environment, intellectual property rights or similar legal restrictions need not to be declared to the public. New requirements concerning declaration of chemicals (REACH directive) shall apply.

3.3 Definition of product group

The product group “building boards” includes all kind of building boards prepared for trade like; gypsum boards, gypsum bonded particle boards, particleboards, OSB boards, fibre boards, plywood, composite boards, decorative high pressure laminate, cement based boards, wall, ceiling and flooring boards etc.

4. Goal

The intended application of this PCR is to give guidelines for carrying out environmental product declaration for building boards and to pinpoint the underlying requirements of the LCA. The user of this PCR will be manufacturers of building boards and other interested parties.
This PCR is valid for all building boards according to the standards shown in chapter 3.2, and on other information for incorporation in a building or other construction work. (i.e. building materials, products, components or building elements).

5. Requirements for the underlying LCA

5.1 Functional and declared unit

This PCR is valid for all building boards according to the standards shown under chapter 1, which are focused on building boards that are manufactured or processed for incorporation in a

building or other construction work. (i.e., building material, products, components, or building elements).
The functional unit of a product provides the quantitative normalisation, for comparing products of equivalent function. For declarations covering the complete life cycle, a functional unit is defined.
For declarations 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. Information provided using a declared unit shall not be used for comparison.

The functional unit (cradle to grave) is:
1 m² of installed building board with a specified function and an expected average service life of 60 years
(packaging included).

The declared unit (cradle to gate) is:
1 m² of produced building board.

5.2 System boundaries

The life cycle stages for the installed building boards are shown in figure 1.

The system boundaries encompass the following processes:

5.2.1 Product stage

- Production of raw materials
- Average transport of raw materials
- Manufacturing of building boards
- transport of raw materials from extraction to manufacturer
- transport of recycled/used materials to manufacturer
- Packaging

5.2.2 Construction stage

- transport of building products from manufacturer to stockist
- transport of building products from stockist to building site
- Installation on the building site

5.2.3 Building stage

The building stage is treated as scenario:

- The reference service life of the building is defined as 60 years and the number of replacements of the building boards shall be declared accordingly.
- Maintenance of the building boards that will be necessary to get the expected reference service life [13]. Maintenance/replacements are to be modelled according to manufacturers' guidelines.
- Releases to ground and surface water during the use of the building boards shall be declared in accordance with national standards and practice[1].

[1] The releases shall refer to specified PH-values, L/S ratio and availability

- Building boards exposed to the indoor environment shall be classified according to prNS 3563, Appendix E (M1, M2, M3), based on emissions of:
  - TVOC
  - Formaldehyde
  - Ammonia
  - Carcinogenic compounds

Methodology to carry out emission tests is shown in [14], [15], [16], [17]. Threshold values for carcinogenic compounds are given in WHO "Air Quality Guidelines for Europe", 1987.

5.2.4 End of life stage

The end of life stage is treated as scenario:

- Dismantling/Demolition
- transport from building site to recycling/reuse/land fill
- Recycling/reuse/energy recovering

The manufacturing and the installation processes shall be declared separately from both the use/maintenance processes (building stage) and from the demolition processes (end of life stage). The building stage and the end of life stage are both based on typical scenarios for the products. The scenarios shall be described in detail.
Any other transportation data 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.

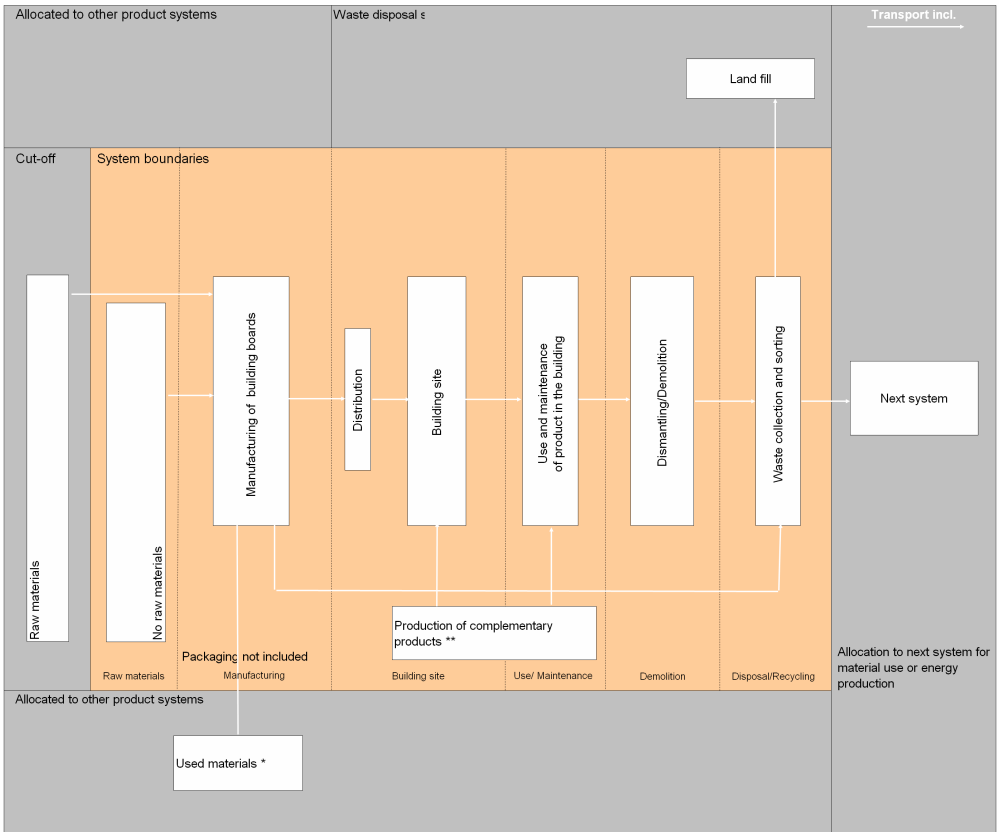

Figure 1 System boundaries and life cycle stages of building boards.

5.3 Cut-off rules

Any processes or activities that altogether do not contribute to more than 2 % of the total mass and 1 % of the total energy use may be omitted from the inventory analysis. However, omissions of any material flows that may have a relevant contribution to the selected impact categories of the products underlying the EPD shall be justified, if applicable by a sensitivity analysis.
All hazardous and toxic materials and substances shall be included in the inventory and the cut-off rules do not apply.

5.4 Allocation rules

In a production process where more than one type of product is generated, it may be 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. For production of building boards the primary allocation rule is that allocation shall be carried out according to mass.

When the building board original function is lost, it can be processed further in a waste management system, e.g. it can be recycled and/or reused and energy recovered.
The recycling processes shall be treated as closed loop recycling, as long as no changes occur 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. Recycled materials that are used in the fabrication of building boards shall have no environmental impact on the new product.
The environmental impacts from recycling and incineration and related transports as well as the recovered energy are allocated to the product they come from according to mass.

When allocation is used, the economic reality and other relevant aspects shall be considered to determine if other allocation criteria would be more appropriate or lead to deviating results. A sensitivity analysis should be initiated if a deviation of > 20% is foreseen.
Different data sets shall be documented and reported, if different allocation options are relevant.

5.4.1 Transportation

Allocation connected to transport shall be based on weight.

5.5. Data Quality requirements

5.5.1 Calculation rules

The amount of material used as input of building boards (functional unit) shall include related accessories and auxiliary materials.

5.5.2 Characterization factors

The factors employed to calculate the selected environmental impacts shall be taken from the following sources, table 1:

Table 1 Characterization factors

Impact category	**Unit /declared unit**	**Source**
Climate change (GWP)	[kg CO_2 equiv]	Latest version of IPCC
Destruction of atmospheric ozone (ODP)	[kg R11 equiv]	Latest version of WHO
Acidification (AP)	[kg SO_2 equiv]	CML 2001
Eutrophication (NP)	[kg PO_4 equiv]	CML 2001
Photochemical Ozone Creation (POCP)	[kg C_2H_4 equiv]	CML 2001

5.5.3 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 should not be older than 10 years.
- **Geographical:** The geographic region of the production sites included in the calculation of representative data shall be documented.
- **Technological:** Data should represent technology in use.

5.5.4 Description of data

The use of specific or average 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 used should be the official one in the country where main energy consuming processes take place, if site-specific data cannot be obtained. The mix of electricity (calculation procedure) shall be documented.
- Hazardous waste shall be specified according to EU Directives 91/689/EEC and 75/442/EEC (specific and/or average background)

The following source, table 2, for generic data shall be used for the European market.

Table 2 Databases

Material	**Database**	**Published**
Steel	IISI (International Iron and Steel Institute) http://worldsteel.org	1998
Copper	ICA (International Copper Association)	1998
Electricity	ECO-PROFILES of the European plastics industry Methodology Plastics Europe (Association of Plastics	1999

	Manufacturers) http://www.plasticseurope.org/	
Aluminium	EAA (European Aluminium Association) http://www.eaa.org/	2005
Plastics	Plastics Europe (Association of Plastics Manufacturers Europe) http://www.plasticseurope.org/	1993-1998
Chemicals	Plastics Europe (Association of Plastics Manufacturers Europe) http://www.plasticseurope.org/	1993-1998

All data has to be specified and it shall include the 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.

5.5.5 Content of substances

A detailed list of the product's substances (chemicals used in manufacture), including CAS number and health class (Risk phrases), shall be included in the product content declaration. The content of substances shall be declared in weight %. In those cases where information of content could affect patent or company secrets, a qualitative list of chemicals and their expected functions is sufficient, including the Risk phrases.

6. Units

The following units shall be used:

- SI units
- Preferred power and energy units:
  - kW (MW) for power
  - kWh (MJ) for electric energy

7. Additional environmental information

Relevant information, such as specific manufacturing processes, beneficial from the environmental point of view can be described. Technical data that is needed to model the building stage e.g. load requirements etc. A description of toxicity effects, occurring in the use of the product, e.g. in processes such as leaching, shall be given.

8. Content of the environmental declaration (EPD)

All Type III environmental declarations in a product category shall follow the format and include the parameters as identified in this PCR.

8.1 General information to be declared

The following general information shall be declared:

- the name and address of the manufacturer(s);
- product identification by name (including e.g. production code) and a simple visual representation of the building product to which the EPD is developed;

- 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 building boards;
- a general specification for the composition of the products shall be given;
- name of the programme and the programme operator's address and, if relevant the logo and website;
- the PCR identification;
- the date the declaration was issued and period of validity;
- additional environmental information;
- a statement of whether the declaration is complete or modular; (ISO 21930);
- a statement that environmental declarations from different programmes (ISO 14025) may not be comparable;
- a statement that this declaration 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;
- the site(s), manufacturer or group of manufacturers or those representing them for whom the results of the LCA are representative;
- information on where explanatory material may be obtained;
- in addition to the above, table 3 shall be completed and reproduced in the Type III environmental declaration;

Table 3 Demonstration of verification

PCR review, was conducted by: < name and organization of the chair, and information on how to contact the chair through the programme operator >
Independent verification of the declaration and data, according to ISO 21930: □ internal □ external
(Where appropriate [a]) Third party verifier: <name of the third party verifier>

a Optional for business to business communication, mandatory for business to consumer communication.

- 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. The stages may be further subdivided, see ISO 21030 Fig 1;
- 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 in the PCR see chapter 5.3.

8.2 Parameters to be declared:

Use of material and energy resources:
depletion of non-renewable material resources
use of renewable material resources

depletion of non-renewable primary energy differentiated into:

- Fossil oil
- Natural gas
- Coal
- Uranium

use of renewable primary energy differentiated into:

- Hydropower
- Wind power/Solar power
- Biomass

use of potable water

Impact category indicator results for:

- Climate change (greenhouse gases). Emission of greenhouse gases (expressed as the sum of global warming potential, GWP in kg CO_2 - equivalents, 100 years).
- Depletion of the stratospheric ozone layer. Emission of ozone-depleting gases (expressed as the sum of ozone-depleting potential, ODP in kg CFC 11-equivalents, 20 years).
- Acidification of land and water sources. Emission of acidifying gases (expressed as the sum of acidifying potential, AP in kg SO_2 - equivalents).
- Eutrophication. Emission of substances contributing to eutrophication potential, (expressed as the sum of nutrition potential, NP in kg PO_4 -equivalents).
- Formation of tropospheric ozone (photochemical oxidants). Emission of gases that contribute to the creation of ground-level ozone (expressed as the sum of ozone-creating potential, POPC, in kg C_2H_4-equivalents).

Waste to disposal

- Non hazardous waste (kg).
- Hazardous waste (kg) according to EU directive 91/689/EEC and 75/442/EE (see also regulation of June 1, 2004 no. 930 of recycling and treatment of waste with amendment by the Ministry of the Environment 2. May 2005 (avfallsforskriften)).

9. References

This PCR is based on the following studies:

1. ISO 21930 Sustainability in building construction - Environmental declaration of building products
2. ISO 14025 Environmental labels and declarations –Type III environmental declarations – Principles and procedures

3. ISO 14044 Environmental management - Life cycle assessment - Requirements and guidelines
4. ISO 14001 Environmental management systems –Requirements with guidance for use
5. EMAS – The Eco-Management and Audit Scheme
6. NS-EN 13986 Trebaserte plater til bruk i bygg og anlegg - Egenskaper, evaluering av samsvar og merking
7. NS-EN 13329 Laminatgulv - Brett med dekksjikt av herdet aminoplast - Krav og prøvingsmetoder
8. NS-EN 438 Dekorative høytrykkslaminater (HPL) - Herdeplastplater (vanligvis kalt laminat) - Del 2: Bestemmelse av egenskaper
9. NS-EN 685 Halvharde gulvbelegg, tekstile gulvbelegg og laminatgulv – Klassifisering
10. NS-EN 520 Gipsplater - Definisjoner, krav og prøvingsmetoder
11. NS-EN 622 Trefiberplater – Krav
12. NS-EN 312 Sponplater - Klassifiseringskrav
13. ISO/DIS 15686-8 Buildings and constructed assets – Service life planning – Part 8: Reference service life
14. prEN 13419-1 Building products – Determination of emissions of volatile organic compounds – Part 1: Emission test chamber method
15. prEN 13419-2 Building products – Determination of emissions of volatile organic compounds – Part 2: Emission test cell method
16. prEN 13419-3 Building products – Determination of emissions of volatile organic compounds – Part 3: Procedure for sampling storage of samples and preparation of test specimens
17. prEN 717-1 Wood-based panels – Determination of formaldehyde release – Part 1: Formaldehyde emission by the chamber method

Appendix I Project documentation/report

Project documentation shall include information, which can be made available to verifier in order to demonstrate that the requirements of ISO 21930 have been met:

- 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;

This includes documentation on:

- the specification used to create the manufacturer's building boards;
- 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 building boards can fulfil 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 building boards;
- 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, normalisation factors and weighting factors used;
- the criteria and substantiation used to determine the system limits and the selection of input and output flows;
- documentation used to substantiate the other choices and assumptions;