

PRODUCT-CATEGORY RULES (PCR)

For preparing an environmental declaration
(EPD) for Product Group

***Mechanical fixed single ply roof waterproofing
membranes (EN 13956)***

NPCR 08



European Single ply
Waterproofing Association

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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 indicated. General information about the company/organization can be included 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 [5], [6].

3.2 Description of product:

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

- 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 mechanical fixed single ply roof waterproofing membranes for flat roofs according to EN 13956 as shown in European Technical Approvals (ETA) or corresponding national approvals;
- 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 regulation 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.

4. Requirements for the underlying LCA

4.1 Functional and declared unit

This PCR is valid for all mechanical fixed single ply roof waterproofing membranes (according to EN 13956 for flat roofs) 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 or declared unit of a product provides the quantitative normalisation, for comparing products of equivalent function (functional unit) or equivalent specification (declared unit). 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.

The functional unit (cradle to grave) is *per m² installed mechanical fixed single ply roof waterproofing membrane for flat roofs with an expected average service life of 30 years* (including packaging). The EPD shall include the number of replacements of the membrane during the building's reference service life.

The declared unit (cradle to gate) is *per m² manufactured single ply roof waterproofing membrane for flat roofs*.

4.2 System boundaries

The life cycle stages for the installed mechanical fixed single ply roof waterproofing membrane for flat roofs are shown in figure 1.

The system boundaries encompass the following processes:

4.2.1 Product stage

- Production of raw materials
- Average transport of raw materials
- Manufacturing of single ply roof waterproofing membrane for flat roofs
- transport of raw materials from extraction to manufacturer
- Average transport of the product to the customer, according to sales amount in Europe
- transport of recycled/used materials to manufacturer
- Installation on the building site
- Welding
- Packaging

4.2.2 Building stage

The building stage is treated as scenario:

- The reference service life of the building is defined as 60 years.
- The number of replacements of the membrane shall be declared accordingly.
- Maintenance of the roof, cleaning of gutters and roof drains will be necessary to maintain the expected reference service life of the roof construction [7]. Furthermore a yearly visual inspection of damage will be necessary. Maintenance/replacements are to be modelled according to manufacturers guidelines
- transport of building products from manufacturer to stockist
- transport of building products from stockist to building site

4.2.3 End of life stage

The end of life stage is treated as scenario:

- Dismantling/Demolition
- transport from building site to recycling/incineration and/or landfill
- Recycling/incineration and landfill

The manufacturing and the installation processes (product stage) 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 product. 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.

When the membrane's original function is lost, it can be processed further in a waste management system, e.g. it can be recycled and/or incinerated. The flows of the recycled material or the heat of the incineration will then become inputs into the next round of production of single ply roof waterproofing membrane, see fig 1.

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. Thus recycled materials that are used in the fabrication of a single ply roof waterproofing membrane 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 [8].

Different data sets shall be documented and reported, if different allocation options are relevant.

4.5. Data Quality requirements

4.5.1 Calculation rules

The amount of material used as input of membrane at the building site during installation (functional unit) shall be calculated as follows:

Installed roofing membrane = manufactured single ply roof waterproofing membrane + overlap and losses at building site. Related accessories, auxiliary materials, flashing and upstandings are not included. Specific data of overlap and losses shall be provided.

Example

- Losses from a 5000 m² roof (50 x 100 m) constitute 5 %
- Seam overlap depends on width of membrane and type of fixing system:
 - general overlap: app. 2% (depends on working and design of the roof)
 - system overlap: app. 1 – 2% (depends on width of membrane)
- 2 m wide sheets are normally used in the field of the roof, 1m wide in corner and perimeter zones.

For welding, which is performed by hot air techniques, with hand held or automatic welding equipment an average energy consumption value $\sim 0,07$ kWh/m² roof surface shall be applied.

4.5.2 Characterization factors

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

Impact category	Unit /declared unit	Source
Depletion of abiotic resources	[kg Sb equiv]	CML 2001
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 ₂ H ₄ equiv]	CML 2001

4.5.3 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.

4.5.4 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 1, for generic data shall be used for the European market.

Table 1 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 Manufacturers) http://www.plasticseurope.org/	1999
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 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.

5. Units

The following units shall be used:

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

6. Additional environmental information

Relevant information, such as specific manufacturing processes, beneficial from the environmental point of view can be described.

A declaration regarding the feedstock¹ energy (HHV, higher heating value) of the single ply roof waterproofing membrane should be provided.

Technical data that is needed to model the building stage e.g. vapour transmission etc.

A description of toxicity effects if relevant.

¹ Combustion heat of raw material inputs that is not used as an energy source, to a product system, expressed in term of higher heating value or lower heating value (ISO/DIS 14044; 2005)

7 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 [1] [2].

7.1 *General information to be declared*

The following general information shall be declared:

- the name and address of the manufacturer(s) see chapter 3.1;
- product identification by name (including e.g. production code) and a simple visual representation of the building product to which the EPD is developed see chapter 3.2;
- the description of the product's use and the functional or declared unit of the product to which the data relates see chapter 3.2;
- the description of the application (installation) of the mechanical fixed roof waterproofing membrane (width of membrane, type of fixing system, system related seam overlap) see chapter 3.2 and 4.5.1;
- a general specification for the composition of the products shall be given see chapter 3.2;
- 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;
- additional environmental information see chapter 6;
- a statement of whether the declaration is complete or modular; see chapter 1
- a statement that environmental declarations from different programmes (ISO/FDIS 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 see chapter 4.5.4;
- the site(s), manufacturer or group of manufacturers or those representing them for whom the results of the LCA are representative see chapter 1 and 4.5.3;
- information on where explanatory material may be obtained;
- in addition to the above, table 2 shall be completed and reproduced in the Type III environmental declaration;

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Table 2 *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 14025: <input type="checkbox"/> internal <input type="checkbox"/> 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 chapter 4.2 and 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 4.2.2 and 4.3.

7.2 **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 and biomass
- use of potable water

Impact category indicator results for:

- Climate change. Emission of greenhouse gases (expressed as the sum of global warming potential, GWP in kg CO₂ - equivalents, 100 years).
- Destruction/depletion of 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 SO₂ - equivalents).
- Eutrophication. Emission of substances contributing to eutrophication potential, (expressed as the sum of nutrition potential, NP in kg PO₄ -equivalents).
- Formation of 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 C₂H₄-equivalents).
- Depletion of abiotic resources Depletion of resources like oil, gas, uranium etc. (expressed as the sum of abiotic resources in kg Sb-equivalents).

Waste to disposal

- Hazardous waste (kg).
- Non hazardous waste (kg) according to EU directive 91/689/EEC and 75/442/EE.

8. References

This PCR is based on the following studies

1. Mechanical fixed single ply roof waterproofing membranes (EN 13956)
2. ISO/DIS 21930 Sustainability in building construction - Environmental declaration of building products
3. ISO/FDIS 14025 Environmental labels and declarations –Type III environmental declarations – Principles and procedures
4. ISO/DIS 14044 Environmental management - life cycle assessment - requirements and guidelines
5. ISO 14001 Environmental management – Specification of the requirements of an environmental management system (EMS)
6. EMAS – The Eco-Management and Audit System – Specification of the requirements of an environmental management system (EMS)
7. ISO/DIS 15686-8 Buildings and constructed assets – Service life planning – Part 8: Reference service life
8. Product Category Rules (PCR) for Uncompounded Polymer Resins, or Reactive Polymer Precursors. PlasticsEurope, 2005

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/DIS 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 single ply waterproofing membranes;
- 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 single ply waterproofing membranes 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/DIS 21930;
- documentation that substantiates the chosen life cycle of the single ply waterproofing membranes;
- 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;