

Draft PCR for Roof waterproofing v5

24 Jan. 18

PRODUCT CATEGORY RULES

EN 15804

NPCR 022 version 2.0

Issue date: xx.xx.2018

Valid to: xx.xx.2023

PCR – Part B for Roof waterproofing





REVISION LOG

This is an overview of the changes made to this PCR. Typology of changes:

- Editorial (ed): Text or layout edited, with no change in content.
- Technical (te): Existing content has been changed.
- Addendum (ad): New content has been added.

Naming convention: Version x.y, where x is a major revision and y is a minor revision.

Date (2018-XX-XX)	Type	Description of change
<i>Version 1.0</i>		
Original version, issued 2017-XX-XX.		

DRAFT



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Introduction

These product category rules (PCR) are intended for companies preparing an environmental product declaration (EPD) for roof waterproofing. The PCR for roof waterproofing consist of two parts. This document contains PCR part B for roof waterproofing, which is the part of the PCR that is specific for roof waterproofing products. Part A contains the requirements that are common for all construction products. When preparing an EPD for roof waterproofing, all requirements outlined in part A and part B must be followed. In PCR part B, the requirements for PCR part A are referred to in each section where they occur. The purpose of this document is to define clear guidelines for performing the underlying life cycle assessment (LCA) to ensure comparability between EPDs.

This PCR was developed from August 2017 to January 2018, by a Norwegian PCR work group (WG) with representatives from the roof waterproofing industry and with aid from Ostfold Research (Østfoldforskning), SINTEF Building and Infrastructure and the EPD program operator The Norwegian EPD Foundation.

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1 Scope

As in PCR part A, including the following additions:

The intended application of this product category rule (PCR) is to give guidelines for the development of environmental product declarations (EPD) for roof waterproofing materials; either cradle to gate with options or cradle to grave; and to further specify the underlying requirements of the life cycle assessment (LCA). The core rules valid for all construction products are given in standard EN 15804 and NPCR Part A, and are expected to be known by those preparing the EPD.

2 Normative references

NPCR Part A: Construction products and services. Ver. 1.0. April 2017. Oslo: EPD-Norge.

3 Terms and Definitions

As in PCR part A.

In addition, the following product-specific terms and definitions are given:

3.1 Plastic and rubber sheets

Membranes made of for example, polyvinylchloride (PVC), thermoplastic olefin (TPO), ethylene-vinyl acetate (EVA), ethylene propylene diene monomer (EPDM) rubber and (PIM).

3.2 Bitumen sheets and shingles

Membranes or shingles made of polymer modified bitumen with reinforcement.

3.3 Metal roof

Self-supporting or fully supported products of metal or metal alloys.

3.4 Tiles

Roof covering products made of concrete or clay.



4. Abbreviations

EPD Environmental product declaration
DU Declared unit
FU Functional unit
PCR Product category rules
LCA Life cycle assessment
LCI Life cycle inventory
LCIA Life cycle impact assessment
RSL Reference service life
ESL Estimated service life

5. General Aspects

5.1 Objective of PCR Part A and B

As in PCR part A.

5.2 Types of EPD in respect to life cycle stages covered

As in PCR part A.

5.3 Comparability of EPD of construction products

As in PCR part A.

5.4 Additional information

As in PCR part A.

5.5 Ownership, responsibility and liability for the EPD

As in PCR part A.

5.6 Communication format

As in PCR part A.

6. Product Category Rules for LCA

As in PCR part A.

6.1 Product Category

As in PCR part A including the following further clarification.

The product group “*Roof waterproofing*” materials comprises of all kinds of *Roof waterproofing products* prepared for trade, made of different materials, and is not limited to those described in 6.1.1. to 6.1.5.

6.1.1 Plastic and rubber sheets

Plastic and rubber sheets are a group of roof-covering materials made of for example polyvinylchloride (PVC), thermoplastic olefin (TPO), ethylene-vinyl acetate (EVA), ethylene propylene diene monomer (EPDM)

rubber and polyisobutylene (PIB), typically with a core of polyester or non-woven glass fibre etc. Stabilizers can be added to achieve extra protection against high and low temperatures, ultraviolet radiation, microbes and fire. These sheets are typically assembled by using hot air welding. They are available in several thicknesses and may have different colour finishes. Roofing made of plastic and rubber sheets can be used as exposed, mechanically fastened roofing on flat and sloping roofs. Some roofing membranes have material properties designed for ballasted roofs and green roofs. Plastic and rubber sheets can be used as a roofing material on all types of surfaces, but may require a separate migration barrier layer on surfaces whereby polystyrene and/or existing membranes are installed. Plastic and rubber sheets for roof waterproofing are produced according to the following standard:

- EN 13956 Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics

6.1.2 Reinforced bitumen sheets and shingles

This is a group of polymer-modified bituminous roofing membranes or shingles with reinforcement. The reinforcement is coated with polymer-modified bitumen and the top surface is protected from UV-light. The roofing membranes and shingles are used for covering sloping and flat roofs. The slope of the roofs must be sufficient to allow rain and melting water to drain away. Bitumen sheets and shingles are produced according to the following standards:

- EN 13707 Flexible sheets for waterproofing - Reinforced bitumen sheets for roof waterproofing - Definitions and characteristics
- EN 544 Bitumen shingles with mineral and/or synthetic reinforcements - Product specification and test methods

6.1.3 Metal roof

A metal roof is a series of cold-rolled metal sheet roofing panels built up into several layers. The core metal layer provides stability, whilst the other layers provide endurance and design. All types of metal sheets for roofs can be used as roofing on ventilated, pitched roofs whereby the roof tiles are laid onto timber battens and counter battens. Metal sheets for roofing are made according to the following standard:

- EN 14782 Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements

6.1.4 Concrete roof tiles

Concrete roof tiles are tiles of casted and pigmented concrete coated with a surface coating to give the wanted optical impression. The tile body is around 10 mm thick concrete, and is made from sand, water, cement and a small percentage of iron oxide pigment. The coatings differ between styrene/acrylic, to pure acrylic and sanded slurry coatings. Polymer coatings are typically 40 - 50 µm thick, whilst slurry coatings are between 1-2 mm thick. All concrete roof tiles can be used as roofing on ventilated, pitched roofs whereby the roof tiles are fixed onto timber battens and counter battens. The tiles are usually fixed by metal fixings to the timber. The relatively small format and large array of fittings makes it easy to adapt concrete roof tiles to different roof shapes, and to make water tight connections with very limited need for chemical sealing or gluing compounds. Concrete tiles for roof coverings are made according to the following standard:

- EN 490 Concrete roofing tiles and fittings for roof covering and wall cladding - Product specifications

6.1.5 Clay roof tiles

Clay roof tiles are pressed, dyed and fired (in a kiln) during the production process. Clay tiles are either used as they are, coated with a glaze, or coated with an engobe/slip mixture to give the wanted optical impression. The tile body is around 10 mm thick fired clay and is typically made from natural clay. The coatings differ between no coating, to a fired frit forming a glassy glazed surface, to a fired clay slurry called engobe or slip. Engobed and glazes surfaces are typically 0,5 mm thick. All clay roof tiles can be used as roofing on ventilated, pitched roofs whereby the roof tiles are fixed onto timber battens and counter battens. The tiles are usually fixed by metal fixings to the timber. The relatively small format and large array of fittings makes it easy to adapt clay roof tiles to different roof shapes, and to make water tight connections with very limited need for chemical sealing or gluing compounds. Clay tiles for roof coverings are made according to the following standard:

- EN 1304 Clay roofing tiles and fittings - Product definitions and specifications

6.2 Life cycle stages and their information modules to be declared

6.2.1 General

As in PCR part A.

6.2.2 A1-A3, Product stage, information modules

As in PCR part A.

6.2.3 A4-A5, Construction process stage, information modules

As in PCR part A including the following further clarification.

Transport in life cycle module A4 shall include the following:

- Direct emissions during transport (exhaust, tyres, etc.)
- Upstream emissions from fuel extraction, processing and distribution
- Life cycle emissions of vehicles (raw materials, manufacturing, maintenance and disposal)
- Life cycle emissions of infrastructure (raw materials, manufacturing, maintenance and disposal)

The installation phase includes all materials and activities connected to the installation of roof waterproofing materials. Insulation, battens, roof sheathing or other construction systems necessary to carry the roof waterproofing product are not included, only the roof waterproofing products with the necessary accessories are included (e.g. screws, fasteners and adhesives etc.). The construction of parapets and upstandings are not included, however the roof waterproofing products covering parapets and upstandings shall be included. The amount of roof waterproofing product covering these purposes shall be documented and justified. The installation scenario shall include life cycle emissions from lifting equipment and welding equipment. Personnel activities and transport of personnel shall not be included.

6.2.4 B1-B5, Use stage, information modules

As in PCR part A including the following further clarification.

In life cycle module B1, the use phase involves emissions to air, soil and water.

Release of substances to indoor air is relevant when the product is used on the inside of the vapour barrier. Release of substances to soil and water are relevant for roof waterproofing materials when they are used in direct contact with soil and/or water.

Reduction of emissions to air is also included in life cycle module B1. This can arise from the carbonation of concrete.

Module B6-B7, Generally, roof waterproofing materials do not require energy or water to operate. Even so, energy and water use shall be modelled.

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

As in PCR part A.

6.2.6 Benefits and loads beyond the system boundary, information module

As in PCR part A.

6.3 Calculation rules for the LCA

For declaring roof waterproofing products, a functional or declared unit as described here can be used. The functional unit should be applied when a specific function and scenario that is typically used is known for the product. If these typical functions and scenarios are many or not known, the declared unit should be used.

The scope and variations of products must be declared according to EPD-Norway guidelines. As of 2014, similar products in the same EPD can only be included if the variations of the results for each LCIA category does not exceed +/- 10 %. The variation shall be stated in the EPD. Special care must be given to composite products.

6.3.1 Functional unit

The functional unit for EPD Cradle to grave is defined as:

1 m² roof installed roof waterproofing, from cradle-to-grave, with activities needed for a study period of 60 years for the building.

Results shall be displayed both per declared unit (cradle to gate) and per functional unit based on scenarios for modules A4-A5, B1-B7, C1-C4 and D.

6.3.2 Declared unit

The declared unit (cradle to gate with option: A1-A3, A4, A5, C1-C4 and D) is defined as:

1 m² of produced roof waterproofing with processes at construction and end-of-life stage.

Results shall be displayed both per declared unit (cradle to gate) and per functional unit based on scenarios

for modules A4-A5, C1-C4 and D.

6.3.3 Reference service life (RSL)

As in PCR part A, and:

Roof waterproofing systems shall be planned and constructed according to a reference service life provided and documented by the manufacturer. If no information is given, the reference service life shall be based on average values provided in SINTEF Building and Infrastructure design guideline (Byggforskserien) intervals for maintenance and replacement of building parts (bks 700.320) or according to the default values provided below:

- 30 years for plastic and rubber sheets
- 30 years for bitumen sheets and shingles
- 60 years for metal roofs of aluminium and copper
- 60 years for concrete and clay tiles

The reference service life of roof waterproofing materials is dependent on how and where the materials are used. The number of material replacements of the roof waterproofing shall be declared in accordance with the building's reference service life. When relevant, Table 10 from chapter 7.3.3.2 of EN 15804, should be applied. The reference service life of a building is set to 60 years.

6.3.4 System boundaries

As in PCR part A.

6.3.5 Criteria for the exclusion of inputs and outputs (cut-off)

As in PCR part A.

6.3.6 Selection of data

As in PCR part A.

6.3.7 Data quality requirements

As in PCR part A.

6.3.8 Scenarios at the product level

As in PCR part A, with the following additions:

6.3.8.1 A4 Transport to the building site

Transport from the manufacturing site to the construction site is estimated based on information from the manufacturer. The following default values can be used for developing scenarios at the product level:

- For domestic production, the default travel distance is 300 km.
- For import, the distance is measured from the manufacturing site to a specific storage location, plus a transport distance from the storage location to the building site (300 km if not specified). If no specific storage location is given, then the capital city of the country that the product is being imported to may be used as an approximate location.

6.3.8.2 A5 Installation

Roof waterproofing material wastage at the building site should be estimated based on information from the manufacturer. If no estimate is available, then the amount of waste is set to 5% by product weight.

The consumption of fasteners, adhesives and necessary accessories shall be based on information given by the manufacturer, and is usually documented in product data sheets or installation manuals. Installation of roof waterproofing materials should be carried out according to the manufacturers guidance for installation, international standards/regulations or national standards/regulations.

Plastic and rubber sheets shall be installed in accordance with the guidelines from the manufacturer and the principles shown in SINTEF Building and Infrastructure design guidelines (Byggforskserien) bks 544.202 and bks 544.206.

Bitumen sheets and shingles shall be installed in accordance with the guidelines from the manufacturer and the principles shown in SINTEF Building and Infrastructure design guidelines (Byggforskserien) bks 544.203, bks 544.204 and bks 544.206.

Metal roofs shall be installed in accordance with the guidelines from the manufacturer and the principles shown in SINTEF Building and Infrastructure design guideline (Byggforskserien) bks 544.103.

Concrete and clay roofs tiles shall be installed in accordance with the guidelines from the manufacturer and the principles shown in SINTEF Building and Infrastructure design guideline (Byggforskserien) bks 544.101.

6.3.8.3 B1-B7 Use phase

The release of substances to air, soil or ground shall be provided as information, see chapter 7.4 in EN 15804:2012. These emissions do not need to be included in the LCA if the emissions are not relevant for the LCIA categories included.

Module B2-B5, Maintenance, repair, replacement and refurbishment scenarios are provided by the manufacturer depending on the area of utilisation. Maintenance of roof waterproofing materials will be required to reach the expected reference service life described.

In terms of plastic, rubber and reinforced bitumen sheets, the replacement procedure will normally be to lay the new sheets on top of the existing sheets. If this is not the case, then the alternative scenario shall be clearly stated and justified. For plastic, rubber and reinforced bitumen sheets maintenance, repair and replacement scenarios are described in SINTEF Building and Infrastructure design guideline (Byggforskserien) bks 744.201.

For metal roofs the maintenance, repair and replacement scenarios are described in SINTEF Building and Infrastructure design guidelines (Byggforskserien) bks 700.320 and bks 744.202.

For clay and concrete tiles the maintenance, repair and replacement scenarios are described in SINTEF

Building and Infrastructure design guideline (Byggforskserien) bks 744.105.

Table 1 defines default scenarios for common roof waterproofing products. These values are conservative and other values can be used if documented by the manufacturer.

Table 1: Default values for use phase scenarios for common roof waterproofing products.

Product standard	Product	RSL	B1	B2	B3	B4	B5	B6	B7
EN 13956	Plastic and rubber sheets	30				1 layer is added	N/A	N/A	N/A
EN 13707	Bitumen sheets	30				1 layer is added	N/A	N/A	N/A
EN 544	Bitumen shingles	30				1 layer is added	N/A	N/A	N/A
EN 14782	Metal sheets of aluminium and copper	60	Metal leaching				N/A	N/A	N/A
EN 490	Concrete tiles	60	Carbonation		10 % replaced	N/A	N/A	N/A	N/A
EN 1304	Clay tiles	60			10 % replaced	N/A	N/A	N/A	N/A

6.3.8.4 C1-C4 End-of-life

Transport from the building/demolition site to the waste treatment/recycling facility is estimated based on information from the manufacturer. Default scenarios for C2 transport to waste processing should be based on national statistics.

Plastic, rubber and reinforced bitumen sheets as well as concrete and clay tiles are normally collected as mixed construction waste. Metal roofs are collected separately and sent to a recovery system for re-use or recycling.

More than one scenario for waste treatment and disposal should be included if there are several relevant common practices, but the most conservative scenario shall always be included. Default conservative scenarios for C3 waste processing and C4 waste disposal are listed Table 2.



Table 2: Default conservative scenarios for life cycle modules C3 and C4.

Product types	C3	C4
Plastic, rubber and bitumen products	Municipal incineration with energy recovery	Landfilling of ashes from incineration
Metal sheets	Central sorting of mixed construction waste, recycling of metals	Landfilling of refused parts
Concrete and clay tiles	Central sorting of mixed construction waste	Landfilling of wasted product in sanitary landfill

6.3.9 Units

As in PCR part A.

6.4 Inventory analysis

As in PCR part A.

6.5 Impact assessment

As in PCR part A.

7. Content of the EPD

7.1 Declaration of general information

As in PCR part A.

7.2 Declaration of environmental parameters derived from LCA

7.2.1 General

As in PCR part A.

7.2.2 Rules for declaring LCA information per module

As in PCR part A.

7.2.3 Parameters describing environmental impacts

As in PCR part A.

7.2.4 Parameters describing resource use

As in PCR part A.

7.2.4.1 Water use

As in PCR part A.

7.2.4.2 Electricity used in A3 Manufacturing

As in PCR part A.

7.2.5 Other environmental information describing waste categories and output flows

As in PCR part A.

7.2.6 Accounting of biogenic carbon during the life cycle

As in PCR part A, including the following additions:

If no specifications are given in PCR part A, biogenic carbon shall be declared according to ISO 21930:2017 or EN 16485:2014.

7.2.7 Greenhouse gas emissions from land use change

As in PCR part A, including the following additions:

If no specifications are given in PCR part A, greenhouse gas emissions from land use change shall be declared according to ISO 21930:2017.

7.2.8 Carbonation

As in PCR part A, including the following additions:

If no specifications are given in PCR part A, carbonisation shall be declared according to ISO 21930, EN 16757:2017 or NPCR 020 Concrete Products.

7.3 Scenarios and additional technical information

7.3.1 General

As in PCR part A.

7.3.2 Construction process stage

7.3.2.1 A4, Transport from the production site to the construction site.

As in PCR part A, including the following additions:

Transport from the production gate to the construction site is typically carried out using trucks. The distance, type of vehicle, fuel consumption and degree to which the transport capacity is utilised may have a large impact on transport emissions, thus these factors must be stated. Capacity utilisation is calculated as a percentage (%) of the total load capacity of the vehicle. The percentage given shall be the average of the capacity utilisation including

the return trip. Table 3 shows which information shall be provided in the EPD when module A4 is included.

Table 3. Information on the transport to the construction site (A4) required in the EPD.

Type	Capacity utilisation (incl return) %	Type of vehicle, incl emissions class	Distance km	Fuel/energy consumption pr tkm	Fuel energy consumption pr km
Truck					
Railway					
Other transport mode					

7.3.2.2 A5, Installation

As in PCR part A, including the following additions:

The EPD shall specify the following information about the installation scenario:

- The consumption of fasteners, adhesives and necessary accessories
- The amount of energy per energy carrier
- Guidance for installation, international standards/regulations or national standards/regulations in which the scenario is based on
- If the EPD deviates from the predefined scenarios, this shall be clearly stated and justified.
- Usage areas and conditions must be specified in the EPD.

7.3.3 Use stage

As in PCR part A, including the following additions:

The number of maintenance and replacement cycles during the service life of the building shall be given.

7.3.4 End of life

As in PCR part A, including the following additions:

It should be mentioned in the EPD if the manufacturers take part in a national or international collection and recycling scheme.

7.4 Additional information

As in PCR part A.

This clause includes all significant environmental and health impacts not included in the impact categories of this PCR. See section 7.2.3.

7.4.1 Additional information on release of dangerous substances to indoor air, soil and water

7.4.1.1 Indoor air

As in PCR part A, including the following additions:

Release of substances to indoor air is relevant when the product is used on the inside of the vapour barrier. The following standard should be applied for measuring emissions to indoor air:

- EN 16516 Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air

7.4.1.2 Soil, ambient air and water

As in PCR part A, including the following additions:

Until horizontal standards for the measurement of leaching characteristics are available, the following report can be used:

- CEN/TR 17105:2017 Construction products. Assessment of release of dangerous substances. Guidance on the use of ecotoxicity tests applied to construction products

7.4.2 Additional Norwegian requirements

As in PCR part A.

7.4.2.1 Greenhouse gas emissions from electricity use in A3 Manufacturing

As in PCR part A.

7.4.2.2 Dangerous substances and content declaration

As in PCR part A, including the following additions:

Specification of materials and substances that can adversely affect human health and environment shall be reported.

A detailed list of the product's substances (chemicals included in the final roof waterproofing product), including CAS number and health class (risk phrases or CLP regulations Regulation (EC) No. 1272/2008) when these are in force, shall be included in the product content declaration. The content of substances shall be declared in terms of weight percentages. Only substances that are mentioned in the raw material safety declaration sheets (SDS) shall be included. The EPD owner has no obligation to investigate the content of ingredients used in raw material production, with the exception of products on the REACH candidate list and the Norwegian Priority List.

In cases where information about contents could affect patent or company secrets, a qualitative list of chemicals and their expected functions is sufficient, including the risk phrases. This does not apply to substances registered under the REACH Directive.

7.4.2.3 Emission classification of building materials

As in PCR part A.

7.5 Aggregation of information modules

As in PCR part A.

8. Project Report

As in PCR part A.

9. Verification and Validity of an EPD

As in PCR part A.

10 Bibliography

As in PCR part A, including the following additions:

ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services

EA NEN 7375:2004. Leaching characteristics of moulded or monolithic building and waste materials. Determination of leaching of inorganic components with the diffusion test. "The tank test"

EN 13707:2013. Flexible sheets for waterproofing - Reinforced bitumen sheets for roof waterproofing - Definitions and characteristics.

EN 13956:2012. Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics.

EN 15814:2011+A2:2014. Polymer modified bituminous thick coatings for waterproofing - Definitions and requirements.

EN 14782:2006. Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements

SINTEF Building and Infrastructure (2018) Design guidelines. SINTEF, Oslo. ISSN 2387-6328.

SINTEF Byggforskserien (2018) Anvisninger. SINTEF, Oslo. ISSN 2387-6328.