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# PRODUCT-CATEGORY RULES

EN 15804

NPCR 22

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## *Roof waterproofing*



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## Introduction

These product category rules (PCR) are intended for companies preparing an Environmental Product Declaration (EPD) type III for *Roof waterproofing* for the building- and construction industry. The purpose of this document is to define clear guidelines for performing the underlying life cycle assessment (LCA) to ensure comparability between EPDs.

The PCR is based on and represent a supplement to the European standard EN 15804:2012 - *Sustainability of construction works – Environmental Product Declarations – core rules for the product category of construction products*. The PCR complies with the ISO standards, ISO 21930:2007, *Building construction - Sustainability in building construction – Environmental declaration of building products* and the requirements of ISO 14025:2006, *Environmental labelling and declarations – Type III environmental declarations – Principles and procedures* and the provisions in ISO 14044:2006, *Environmental management — Life cycle assessment — Requirements and guidelines*.

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The EPDs based on this PCR-document are covering three perspectives:

1. EPD – cradle to gate
2. EPD – cradle to gate with options
3. EPD – cradle to grave

and will present data that has been aggregated over the relevant life cycle stages as described in chapter 6 and shown in figure 2.

Program operator:

The Norwegian EPD Foundation  
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The members of the Norwegian PCR Work Group have prepared this PCR.

### Members of the PCR WG:

Icopal A/S, Reinforced bitumen sheets and shingles, Metal roof  
Isola A/S, Reinforced bitumen sheets and shingles, Metal roof  
Protan A/S, Plastic and rubber sheets  
Monier A/S, Tiles (Concrete, Clay)

This PCR is a common European PCR with an appendix A1 giving specific guidelines according to Norwegian requirements.

## Cross references

Table 1 sums up the most important aspects defined distinctively for this particular product category. More details are given in the following chapters.

Table 1: PCR for Roof waterproofing for the building- and construction industry executive summary

Chapter	Topic	PCR – Roof waterproofing for the building- and construction industry	Cross references			
			ISO 14044	ISO 14025	ISO 21930	EN 15804
3	Terms and definitions		3	3	3	3
5.2	Type of EPDs with respect to life cycle stages covered	Cradle to gate for all products (A1 – A3) Cradle to grave (A1 – C4)				5.2
6.1	Definition of product category	Roof waterproofing products		6.7.1 6.7.2	6.2.2	6.1
6.3.1	Functional unit	EPD Cradle to grave: 1 m <sup>2</sup> Roof waterproofing with a specified reference service life.	4.2.3.1 4.2.3.2		6.2.4	6.3.1
6.3.2	Declared unit	EPD Cradle to gate: 1 m <sup>2</sup> Roof waterproofing			6.2.3	6.3.2
6.3.3	Reference service life	EPD Cradle to grave: to be specified.				6.3.3
6.3.4	System boundaries	EPD Cradle to gate: A1-A3 EPD Cradle to grave A1-C4	4.2.3.1 4.2.3.3 4.3.3.4		6.2.5 5.5	6.3.4
6.3.7	Data quality	Data quality requirements	4.2.3.6		6.2.6 6.2.8	6.3.7
6.3.8	Construction stage A4-A5	Cradle to grave				6.3.8
6.3.9	Use B1- B7	Cradle to grave				6.3.8
6.3.4.5	End of life C1- C4	Cradle to grave				6.3.4
6.4.3	Allocation rules	Allocation according to mass [kg]	4.3.4		6.2.7.1	6.4.3
7.4	Additional information	The content of harmful substances/ must be declared in EPD		7.2.3 7.2.4		7.4

## 1 Scope

The intended application of this Product Category Rules (PCR) is to give guidelines for development of Environmental Product Declarations (EPD) for **all kind of Roof waterproofing prepared for trade** and to further specify the underlying requirements of the LCA. The core rules valid for all construction products are given in standard EN 15804:2012 and are expected to be known by those preparing the EPD.

## 2 Normative references

ISO 14025:2006, *Environmental management – Type III environmental declarations – Principles and procedure.*

ISO 21930:2007, *Sustainability in building and construction – Environmental declaration of building products.*

ISO 14044:2006, *Environmental management – Life cycle assessment – Requirements and guidelines.*

ISO 15686-1:2000, *Buildings and constructed assets — Service life planning — Part 1: General principles*

ISO 15686-8:2008 *Buildings and constructed assets – Service life planning – Part 8: Reference service life*

EN 15804:2012, *Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.*

EN 15942:2011, *Sustainability of construction works – Environmental product declarations – Communication formats: business to business.*

## 3 Terms and definitions

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

### 3.1

#### **declared unit**

quantity of a building product for use as a reference unit in an EPD, based on LCA, for the expression of environmental information needed in information modules

Example: Mass (kg), Volume (m<sup>3</sup>)  
[ISO 21930]

### 3.2

#### **functional unit**

quantified performance of a product system for a building product for use as a reference unit in an EPD based on LCA

[ISO 21930]

### 3.3

#### **information module**

compilation of data to be used as a basis for a Type III environmental declaration, covering a unit process or a combination of unit processes that are part of the life cycle of a product

[ISO 21930]



### 3.4

#### **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]

### 3.5

#### **product category**

group of building products that can fulfil equivalent functions

[ISO 21930]

### 3.6

#### **reference service life**

service life of a building product that is known or expected under particular set, i.e., a reference set, of in-use conditions and that may form the basis of estimating the service life under other in-use conditions

NOTE The reference service life is applied in the functional unit

[Adapted from ISO 21930]

### 3.7

#### **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]

### 3.8

#### **Common Roof waterproofing products**

#### 3.8.1

##### **Plastic and rubber sheets**

Membranes made of e.g. PVC, TPO, EVA, EPDM, PIM.

#### 3.8.2

##### **Bitumen sheets and shingles**

Membranes or shingles made of polymer modified bitumen with reinforcement.

#### 3.8.3

##### **Metal roof**

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

#### 3.8.4

##### **Tiles**

Roof covering products made of concrete or clay

## **4 Abbreviations**

EPD Environmental product declaration

PCR	Product category rules
LCA	Life cycle assessment
LCI	Life cycle inventory analysis
LCIA	Life cycle impact assessment
RSL	Reference service life
ESL	Estimated service life
PVC	Poly-Vinyl-Chloride
TPO	Thermo-Plastic Olefins
EVA	Ethylene-Vinyl-Acetate
EPDM	Ethylene-Polymer-Diene-Monomers
PIB	Poly-Iso-Butylene

## 5 General aspects

### 5.1 Objective of the PCR

To ensure provision of verifiable and consistent data for EPDs for Roof waterproofing based on LCA and describes reliable and realistic scenarios.

### 5.2 Types of EPD

This PCR cover the following type of EPD (see figure 1):

- EPD 1: Cradle to gate (A1 – A3)
- EPD 2: Cradle to gate with options (A1- C4)
- EPD 3: Cradle to grave (A1 – C4)

### 5.3 Comparability of EPD of construction products

Comparison of environmental performance of construction products using EPD information shall be based on the product's use and its impacts on the building, and shall consider the complete life cycle.

General rules for comparability are given in the standard EN 15804:2012, clause 5.3.

Contents of EPD project report and EPD shall be as specified in EN 15804:2012, clause 8

### 5.4 Additional information

See clause 7.4.

### 5.5 Ownership, responsibility and liability for the EPD

The manufacturer or a group of manufacturers are the sole owners and have liability and responsibility for an EPD.



## 5.6 Communication formats

The communication format of the EPD shall be in accordance with EN 15942:2010.

# 6 Product Category Rules for LCA

## 6.1 Product Category

The product group “Roof waterproofing” comprises all kind of Roof waterproofing prepared for trade made of different materials not only plastic, rubber, bitumen, metal and tiles as shown 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 t.g. PVC, TPO, EVA, EPDM, PIB with a core of polyester, non-woven glass fibre etc. Stabilizers can be added to achieve extra protection against high and low temperatures, ultraviolet radiation, microbe and fire. Assemble typically by using hot air welding. They are available in several thicknesses and may have different colours on the surfaces. Roofing made of the plastic and rubber sheets can be used as exposed, mechanically fastened roofing on flat and sloping roofs. Some qualities are designed for ballasted roofs and green roofs. Plastic and rubber sheets can be used as roof on all types of surfaces, but can require separate migration barrier layer on surfaces of polystyrene and existing membranes installed.

### 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 has protection 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.

### 6.1.3 Metal roof

Roofing-tile panels are cold-rolled metal-sheet roofing panels built up by several layers. The metal main layer provides stability and the others provide endurance and design. All product types can be used as roofing on ventilated, pitched roofs where the roof tiles are laid on timber battens and counter battens.

### 6.1.4 Concrete Tiles Roofs

Concrete roof tiles are tiles of casted-pigmented concrete coated with a surface coating to give the wanted optical impression. The tile body is about 10 mm thick concrete based on sand, water, cement and a small percentage of iron oxide pigment. The coatings differ between non to styrene/acrylic to pure acrylic to sanded slurry coatings. Polymer coatings are typically 40 - 50 µm thick. Slurry coatings are 1-2 mm. All product types can be used as roofing on ventilated, pitched roofs where the roof tiles are laid on timber battens and counter battens. The tiles are fixed by metal fixings to the timber. The relatively small format and a large array of fittings make it easy to adapt to roof shapes and to make water tight connections and outlets with very limited need for chemical sealing/gluing compounds.

### 6.1.5 Clay Tiles Roofs

Clay roof tiles are tiles pressed dyed and fired clay. Clay tiles are used as they are or surface coated with a glaze or an engobe coating to give the wanted optical impression. The tile body is about 10 mm thick fired clay based on natural clay. The coatings differ between non to fired clay slurry called engobe to fired frit forming a glassy glazed surface. Engobed and glazes surfaces are typically 0,5 mm. All product

types can be used as roofing on ventilated, pitched roofs where the roof tiles are laid on timber battens and counter battens. The tiles are fixed by metal fixings to the timber. The relatively small format and the a large array of fittings make it easy to adapt to roof shapes and to make water tight connections and outlets with very limited need for chemical sealing/gluing compounds.

## **6.2 Life cycle stages and their information modules to be included**

### **6.2.1 General**

Which modules or life cycle stages to include are dependent on defined type of EPD given in chapter 5.2. In EPD 1 (cradle to gate), a manufacturer may choose to declare additional information without calculating optional life cycle stages to ensure proper understanding of a product's function in a building and thus support proper scenario development at the building level. All additional technical information is declared in the module, to which it refers (e.g. technical information about the use of a product in the appropriate use stage module B.)

### **6.2.2 A1-A3, Product stage information modules**

- A1, raw materials extraction
- A2, transport to manufacturer
- A3, manufacturing of the product and packaging, including provision of all materials, products and energy, as well as waste processing up to the end-of-waste or disposal of final residues during the product stage.

### **6.2.3 A4-A5, Construction process stage, information modules**

- A4, transport to the building site
- A5, installation into the building including provision of all materials, products and energy, as well as waste processing up to the end-of-waste state or disposal of residues during the product stage.

### **6.2.4 B1-B5, use stage, information modules related to the building fabric**

- B1, use
- B2, maintenance
- B3, repair
- B4, replacement
- B5, refurbishment

### **6.2.5 B6-B7, use stage, information modules related to operation of the building**

- B6, operational energy use, *not relevant*
- B7, operational water use, *not relevant*

### **6.2.6 C1-C4, end of life stage, information modules**

- C1, deconstruction, demolition
- C2, transport to waste processing
- C3, waste processing for reuse, recovery or recycling
- C4, disposal

### **6.2.7 D, benefits and loads beyond the system boundary, information modules**

- D, reuse, recovery, recycling potentials.

## 6.3 Calculation rules for the LCA

### 6.3.1 Functional unit

The functional unit (cradle to grave) is:

*1m<sup>2</sup> roof installed Roof waterproofing with a specified reference service life*

Results should be displayed per functional unit based on scenarios for construction process stage, use stage and end of life stage, see clause 7.3.

### 6.3.2 Declared unit

The declared unit (cradle to gate) is:

*1 m<sup>2</sup> produced Roof waterproofing*

### 6.3.3 Reference service life

Service life has to be defined in compliance with EN15804:2012, or as minimum based on verified European statistic data for the considered Roof waterproofing.

### 6.3.4 System boundaries

The life cycle stages for Roof waterproofing are shown in figure 1. See also Figure 1 in EN 15804:2012. The environmental impact shall be documented for each of the life cycle stages and in total (cradle to grave).

#### 6.3.4.1 General

This clause will specify the boundary of the Roof waterproofing system should be based on two principles:

- Modularity principle as shown in figure 1.
- Polluter pays principle as shown in EN 15804:2012, clause 6.3.4.1.

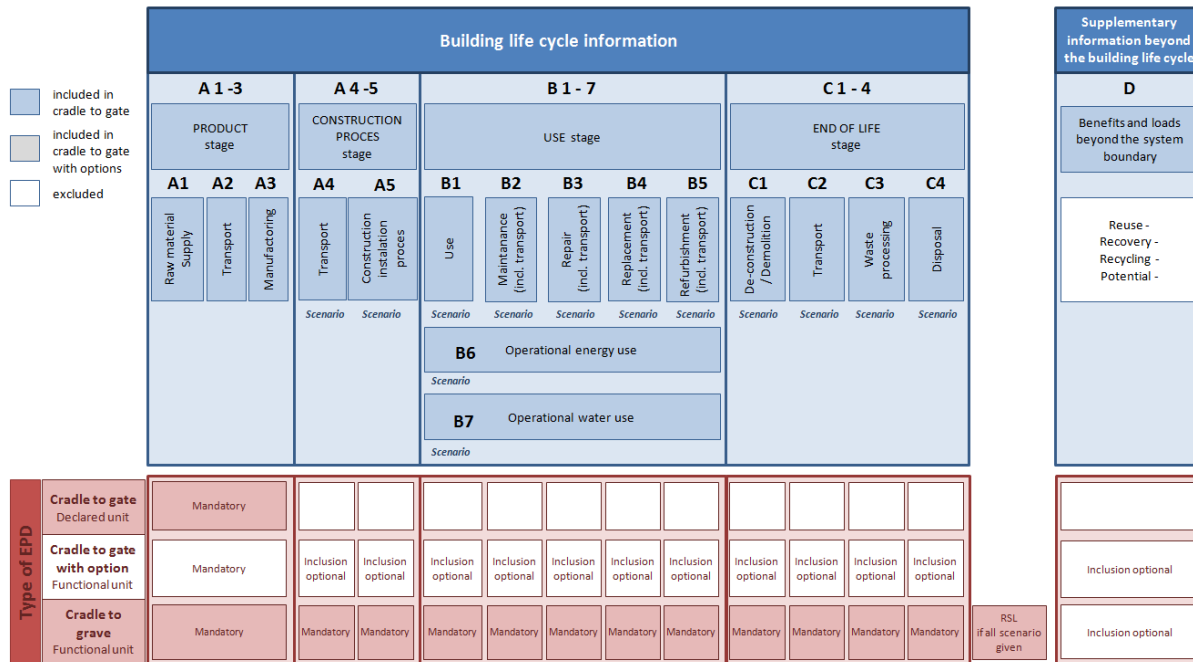


Figure 1 Life cycle stages for Roof waterproofing

### 6.3.4.2 Product stage

- A1 extraction of new materials, reuse of materials from previous systems, processing of secondary materials (look at definitions)
- A2 transport of goods and resources up to the factory gate and including internal transport (describe and justify).
- A3 production of ancillary products (fasteners, screws etc.), manufacturing of products and co-products, manufacturing of packaging.

### 6.3.4.3 Construction stage

- A4 transport of goods and resources from factory gate to construction site (via dealer or distance from manufacturer directly to building site) including internal transport (describe and justify).
- A5 storage of products including provision of heating and cooling, waste, waste processing, installation of the product including ancillary products (screws and nails) and energy required for installation

### 6.3.4.4 Use stage

- B1, use *not relevant*
- B2 production and transport of any component and ancillary products used for maintenance, including cleaning, transport of any waste from maintenance process, end of life process of any waste from maintenance
- B3 production of repaired part, use of energy, transportation of repaired part, waste handling of repaired part
- B4 production of replacement part, use of energy, transportation of replenishment part, waste handling of replenishment part

- B5 production of components used for refurbishment, related energy used, transport of waste of the refurbishment
- B6, operational energy use *not relevant*
- B7, operational water use *not relevant*

#### **6.3.4.5 End of life stage**

- C1, deconstruction, on site sorting
- C2, transport from the building site to waste processing site including internal transport (describe and justify).
- C3, waste processing for reuse, recycling and energy recovery
- C4, waste disposal

#### **6.3.4.6 Benefits and loads beyond the product system boundary in module D**

- D, information of net benefits that is realistic and operational in current building practice, and loads that have not been allocated as co-products and that have passed end-of-waste state. If waste management systems exist, it can be described.

#### **6.3.5 Criteria for the inclusion of inputs and outputs (cut-off)**

General cut-off criteria are given in standard EN 15804:2012, clause 6.3.5.

#### **6.3.6 Selection of data**

Specific data derived from the production process shall be used. Generic data can be used for processes the manufacturer cannot influence, i.e. up- and downstream processes.

#### **6.3.7 Data quality requirements**

General requirements and guidelines concerning use of generic and specific data and the quality of those are described in the standard EN 15804:2012, clause 6.3.6 and 6.3.7. The quality of the data used to calculate an EPD shall be addressed in the project report (see chapter 8 and ISO 14044:2006, clause 4.2.3.6).

In addition the following rules should be applied:

- For manufacturing of product, specific annual data shall be applied
- Actual data age (when data was collected) shall be stated.
- If site-specific data cannot be obtained, the mix of electricity used shall be the grid mix in the country where main energy consuming processes take place. The mix of electricity (calculation procedure) shall be documented.
- If an EPD exist for an included product or material from same Programme Operator and/or with a valid verification, data from the EPD should be used.
- For directly consumed heat and electricity, infrastructure shall be included in accordance with PCR for Electricity, Steam, and Hot and Cold Water Generation and Distribution, PCR CPC 17 [7].
- Hazardous waste shall be specified according to relevant national regulations.

#### **6.3.8 Developing product level scenarios**

Scenarios shall support the calculation of information modules except the modules A1-A3. A scenario shall be based on relevant technical information and is shown in 7.3.

### 6.3.9 Units

SI units shall be used.

## 6.4 Inventory analysis

### 6.4.1 Collecting data

Data collection shall follow the guidelines provided in ISO 14044:2006, clause 4.3.2

### 6.4.2 Calculation procedures

The calculation procedures described in ISO 14044:2006 clause 4.3.3 shall apply.

### 6.4.3 Allocation of input flows and output emissions

General allocation rules including closed-loop and open-loop allocation procedures are given in the standard EN 15804:2012, clause 6.4.3.

Allocation should be performed in the following order

- 1 Physical properties (e.g. mass)
- 2 Economic value

## 6.5 Impact assessment

The characterisation factors in the European Reference Life Cycle Database (ELCD) provided by the European Commission or the CLM method shall be used.

Parameters shall be declared and reported according to standard EN 15804:2012, clause 7.2.2.

Environmental impact shall be declared as stated in EN 15804:2012, clause 7.2.3, table 3:

- Global warming potential, GWP, in kg CO<sub>2</sub> equivalents, 100 years
- Depletion potential of the stratospheric ozone layer, ODP, in kg CFC 11 equivalents, 20 years
- Acidification potential of land and water sources, AP, in kg SO<sub>2</sub> equivalents
- Eutrophication potential, EP in kg (PO<sub>4</sub>)<sup>3-</sup> equivalents
- Formation potential of tropospheric ozone photochemical oxidants, POCP, in kg C<sub>2</sub>H<sub>4</sub> equivalents.
- Abiotic depletion potential for non-fossil fuels in Sb equivalents<sup>1</sup>
- Abiotic depletion potential for fossil resources in MJ, net calorific value.<sup>2</sup>

Waste to disposal should be declared as:

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

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<sup>1-2</sup>The indicator describing the depletion of abiotic resources is subject to further scientific development. The use of these indicators is intended to be reviewed during the revision of the Standard EN 15804:2012.



## **7 Content of the EPD**

### **7.1 Declaration of general information**

The content of the EPD shall follow the instruction given in EN 15804:2012, clause 7.1 and 7.2.

The declaration of material content of the product shall list as a minimum substances contained in the product that are listed in the “Candidate list of Substances of Very High Concern for authorization” when their content or the sum of the different contents exceeds the limits for registration with the European Chemicals Agency.

### **7.2 Declaration of environmental parameters derived from LCA**

#### **7.2.1 General**

Documentation of technical information for the construction process shall follow the requirements given in EN 15804:2012, clause 7.3.2.

Transport shall be allocated based on weight. Transport information shall be provided according to EN 15804:2012, table 7.

#### **7.2.2 Rules for declaring LCA information per module**

The rules shall follow EN 15804:2012, clause 7.2.2.

#### **7.2.3 Parameters describing environmental impacts**

Parameters shall be according to EN 15804:2012, table 3.

#### **7.2.4 Parameters describing resource use**

Parameters shall be according to EN 15804:2012, table 4.

#### **7.2.5 Other environmental information describing waste categories and output flows**

Parameters shall be according to EN 15804:2012, table 5 and 6.

### **7.3 Scenarios and additional technical information**

#### **7.3.1 General**

Documentation of technical information for the construction process shall follow the requirements given in EN 15804:2012, clause 7.3.2.

Transport shall be allocated based on weight. Transport information shall be provided according to EN 15804:2012, table 7.

#### **7.3.2 Construction process stage**

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

If no European information is available, national transport scenarios and distances may be used and documented in the EPD project report.

##### **7.3.2.2 A5, Installation**

The installation phase includes all materials and activities connected to installation of Roof waterproofing.

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 (screws, fasteners, adhesives etc.). The construction of parapet and upstanding are not included, but the roof waterproofing products covering the parapet and upstanding shall be included. The amount of products covering these purposes shall be documented and justified.

The consumption of fasteners, adhesives and necessary accessories shall be based on information given by the manufacturer.

The installation shall include lifting equipment and energy consumption of welding equipment.

Example: For welding, performed by hot air techniques (electricity), with hand held or automatic welding equipment an average energy consumption  $\sim 0,25 \text{ MJ/m}^2$  roof surface may be applied.

The similar figure for Europe for welding with propane will be  $\sim 4,6 \text{ MJ/m}^2$  roof surface.

The figures used shall be documented and justified.

Personnel activities and transport of personnel as well as environmental impact from production of capital goods shall not be included.

Installation of Roof waterproofing should be carried out according to the manufacturers Guidance for installation, international standards/regulations or national standards/regulations.

If the EPD deviates from the predefined scenarios, this shall be clearly stated and justified.

### **7.3.3 Use stage**

#### **7.3.3.1 B1-B5 use stage related to the building fabric**

- B1 *not relevant*

- B2- B5 information required for maintenance, repair, replacement and refurbishment shall be given according to EN 15804:2012, Table 9 (use stage reference to the building fabric) and Table 10 (reference service life). Maintenance/replacements are to be modelled according to manufacturers' guidelines.

Maintenance of Roof waterproofing that will be required to reach the expected reference service life shall be described.

In connection with plastic and rubber sheets and reinforced bitumen sheets, the replacement procedure will normally be to lay the new sheets on top of the existing sheets. If not the case, this shall be clearly stated and justified.

#### **7.3.3.2 Reference service life**

The reference service life of Roof waterproofing is depending on materials used and location. The number of replacements of Roof waterproofing shall be declared accordingly to the building's reference service life. When relevant EN 15804:2012, Table 10 should be applied.

#### **7.3.3.3 B6, use of energy and B7, use of water**

- B6 – B7 *not relevant*

### **7.3.4 End of life**

End of life shall be specified according to EN 15804:2012, Table 12.

## 7.4 Additional information

An EPD for roof waterproofing shall include the following information related to additional environmental issues, in addition to the environmental information derived from the LCA.

### 7.4.1 Indoor air

*Not relevant*

### 7.4.2 Soil and water

A description of toxicity effects, occurring in the use of the product, e.g. in processes such as leaching, shall be given. Releases to ground and surface water during the use of the Roof waterproofing shall be declared in accordance with national standards and practice.

## 7.5 Aggregation of information modules

Indicators declared in the individual information modules shall not be added up in any combination of the individual information modules into a total or sub-total of the life cycle stages A, B, C or D (EPD – cradle to gate with options), with exception of A1, A2 and A3 that may be aggregated.

## 8 Project report

The project report is the systematic and comprehensive summary of the project documentation supporting the verification of an EPD. The project report shall record that the LCA based information and the additional information as declared in the EPD meet the requirements of EN 15804:2012. It shall be made available to the verifier with the requirements on confidentiality stated in ISO 14025. The project report is not part of the public communication.

The project report shall follow the instructions given in ISO 14044, clause 5.2 and EN 15804:2012, clause 8.

## 9 Verification and validity of an EPD

The process of verification of an EPD shall be in accordance with ISO 14025:2006, clause 8 and ISO 21930:2007, clause 9. After verification an EPD is valid for a 5 years period. An EPD does not have to be recalculated after 5 years, if the underlying data has not changed significantly.

### *Bibliography*

EN 13707:2004+A2:2009.

PCR 2007: Product category rules for preparing an environmental declaration for Electricity, Steam, Hot and cold water, generation and distribution, PCR CPC 17, Version 1.1.

Candidate list of Substances of Very High Concern for authorization.

<http://echa.europa.eu/web/guest/candidate-list-table>

Approved 10.12.2012, valid until 10.12.2017

Norwegian EPD Foundation, PCR Review Panel

*Sverre Fossdal*

Sverre Fossdal

Panel chairman/Dr. Ing

## APPENDIX A1

(informative)

### Norwegian requirements

This appendix describes Norwegian requirements given by the program operator The Norwegian EPD Foundation.

#### 1 Communication format and content of the Norwegian EPD

The communication format of the EPD shall be in accordance to EN 15942:2011 and the presentation template shown in [www.epd-norge.no](http://www.epd-norge.no).

#### 2 Treatment of electricity

The electricity mix used shall be shown in the EPD as emissions of g CO<sub>2</sub> equivalents per kWh or g CO<sub>2</sub> equivalents per MJ.

#### 3 Reference service life

Roof waterproofing systems shall be planned and constructed for a reference service life given by the manufacturer. If no information is given the reference service life shall be based on the figures given in SINTEF Building Design Sheets and 700.320 part II.

30 years for Plastic and rubber sheets, Bitumen sheets and singles

50 years for Metal roofs

60 years for concrete and clay tiles

The reference service-life of a building is 60 years.

#### 4 Key Environmental Parameters

On page two of the EPD the key Environmental parameters (max 5) shall be shown in a table surrounded by a red frame.

Parameters to be shown are;

Global warming potential, GWP, in kg CO<sub>2</sub> equivalents

Total energy consumption in MJ

Hazardous substances type and justification

##### 4.1 Hazardous substances

If the roof waterproofing product contains any of the following substances, they shall be declared in the EPD document and justified:

- Products, which contain substances on the Candidate list of substances of very high concern (SVHC) in a concentration above 0.1wt%, see <http://www.echa.europa.eu/web/guest/candidate-list-table>
- substances on the Norwegian Priority list, see <http://www.miljostatus.no/no/Tema/Kjemikalier/Kjemikalielister/Prioritetslisten/>
- substances that are not in compliance with the regulatory levels set in the Norwegian Regulations related to restrictions on the manufacture, import, export, sale and use of chemicals and other

products hazardous to health and the environment (Product Regulations/Produktforskriften), see <http://www.lovdatab.no/>

See also the requirements in [BREEAM-NOR A-20 list](#).

If no such substances occur the following statement shall be given in the EPD:  
The following substances have not been added to the product: substances on the Candidate list of substances of very high concern, substances on the Norwegian Priority list and substances that lead to the product being classified as hazardous waste. The chemical content of the product complies with regulatory levels as given in the Norwegian Product Regulations.

## 5 Laying scenarios

### 5.1 Plastic and rubber sheets

The plastic and rubber sheets shall be installed in accordance with the guidelines from the manufacturer and the principles shown in SINTEF Building Design Sheets 544.202 and 544.206.

### 5.2 Reinforced bitumen sheets and shingles

The membrane shall be installed in accordance with the guidelines from the manufacturer and the principles shown in SINTEF Building Design Sheets 544.203, 544.204 and 544.206.

For welding, performed by hot air techniques (electricity), with hand held or automatic welding equipment an average energy consumption  $\sim 0,25 \text{ MJ/m}^2$  roof surface may be applied. The similar figure for Norway for welding with propane will be  $\sim 6,4 \text{ MJ/m}^2$  roof surface. The figures used shall be documented and justified.

### 5.3 Metal roofs

The metal roofs shall be installed in accordance with the guidelines from the manufacturer and the principles shown in SINTEF Building Design Sheets and 544.103.

### 5.4 Tiles

Roofs tiles shall be installed in accordance with the guidelines from the manufacturer and the principles shown in SINTEF Building Design Sheets and 544.101.

## 6 Scenarios and additional technical information

### 6.1 Use stage

Maintenance and replacements are to be modelled according to manufacturer's guidelines. For plastic and rubber sheets and reinforced bitumen sheets maintenance, repair and replacement are described in SINTEF Building Design Sheets and 744.201.

For metal roofs maintenance, repair and replacement are described in SINTEF Building Design Sheets and 744.105.

For clay tiles and concrete tiles maintenance, repair and replacement are described in SINTEF Building Design Sheets and 744.105.

## **6.2 End of life**

Metal roofs will be collected separately and sent to a recovery system for re-use or recycling. Tiles and plastic and rubber sheets and reinforced bitumen sheets will normally be collected with mixed construction waste.

For manufacturers who take part in a national or international collection and recycling scheme it should be mentioned in the EPD.