

PRODUCT-CATEGORY RULES (PCR)

For preparing an environmental declaration
(EPD) for Product Group

**Piping systems for use for sewage and storm water
(under gravity)**

NPCR 19
September 2012

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Introduction

These product category rules (PCR) are intended for companies preparing an Environmental Product Declaration (EPD) for Piping systems for use for sewage and storm water (under gravity) EN 476, (see clause 6.1 for definition of product group). 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 - *Sustainability of construction works – Environmental Product Declarations – core rules for the product category of construction products*. The PCR complies with the standard ISO 14044, ISO 14025 and EN 15804. For concrete pipes this PCR should be seen in context with PCR for cement (PCR 2004) and concrete (PCR 2005) and updates.

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The EPD will present data that has been aggregated over the life cycle stages “Product stage”, “Installation/lying stage”, “Use stage” and “End of life stage”.

The PCR is defining rules for developing LCAs and EPDs for producers of pipes piping system for sewage and storm water.

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

Members of the PCR WG:

Basal (pipe manufacturer organisation)
NPG Norge (pipe manufacturer organisation)
SAINT GOBAIN PAM (pipe manufacturer)
Østfoldforskning (Ostfold Research)

This PCR is a common PCR for all European countries, but 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 sections.

Table 1: PCR for piping systems for use for sewage and storm water (under gravity) – executive summary

Section	Topic	PCR –Piping systems for sewage and storm water (under gravity)	Reference in ISO 14044	Reference in ISO 14025	Reference in EN 15804
4	Terms and definitions	Piping systems for sewage and storm water	3	3	3
6.1	Definition of product category	Piping systems for sewage and storm water		6.7.1 6.7.2	6.1
6.2.1	Functional unit	100 meters of piping system			6.3.1
6.2.2	Reference service life	100 years			6.3.3
6.2.3	System Boundaries (Life cycle)	Cradle to grave	4.2.3.3 4.3.3.4		6.3.4
6.2.5	Data quality	For all stages	4.2.3.6		6.3.7
6.2.6	Scenarios for product level				
6.2.6.1	Installation/laying process (Construction stage)	Excavation of trench, refilling, production of gravel,			7.3.1
6.2.6.2	Use – operation	Not relevant			7.3.2
6.2.6.3	Use – maintenance				7.3.2
6.2.6.4	End of life				7.3.3
6.3.1	Allocation rules	Allocation according to mass	4.3.4		6.4.3
7	Additional information			7.2.3 7.2.4	7.4 8.2

1 Scope

The intended application of this Product Category Rules (PCR) is to give guidelines for development of Environmental Product Declarations (EPD) for piping systems for use for sewage and storm water (under gravity) 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 are expected known by those preparing the EPD.

2 Normative references

ISO14025: 2006, *Environmental management – Type III environmental declarations – Principles and procedure.*

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

ISO14044: 2006, *Environmental management – Life cycle assessment – Requirements and guidelines.*

ISO15686-1: 2000, *Buildings and constructed assets – Service life planning – Part 1: General principles*

ISO15686-8: 2008, *Buildings and constructed assets – Service life planning – Part 8: Reference service life*

EN15804: 2012, *Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.*

EN15942: 2011, *Sustainability of construction works – Environmental product declarations – Communication formats: business to business*

3 Terms and definitions

General definitions are given in the standard EN 15804:2012, clause 3.

3.1 Environmental product declaration (EPD)

Environmental declaration providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information

[EN 15804:2012]

3.2 Functional Unit

the quantified performance of a product system for use as reference unit

[EN 15804:2012]

3.3 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 14044:2006]

3.4 Product category rule (PCR)

a set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories

[ISO 14025:2006]

3.5 Piping system for storm water

piping system including fittings and inspection chambers/manholes leading rain, drain and surface water from collections of water (basins/manholes) to outflow/collector.

3.6 Piping system for sewage

piping system including fittings and inspection chambers/manholes for transport of sewage.

3.7 Piping system function

The function of the sewer pipe system for sewer applications is to transport (gravity discharge) a certain amount of sewage from the entrance of a public sewer system to the entrance of the wastewater treatment plant.

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

5 General aspects

5.1 Objective of the PCR

To ensure provision of verifiable and consistent data for an EPD based on LCA and describe reliable 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 grave (A1 – C4)

5.3 Comparability of EPD of construction products

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

6 Product Category Rules for LCA

6.1 Product Category

The product group *Piping systems for use for sewage and storm water (under gravity)* EN 476) includes pipes, fittings, inspection chambers/manholes produced from all types of materials.

6.2 Life cycle stages and their information modules to be included

6.2.1 General

The environmental information of an EPD covering all life cycle stages shall be subdivided into information module groups A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D.

6.2.2 A1-A3, Product stage information modules

- A1, raw materials extraction
- A2, transport to manufacturer
- A3, manufacturing

6.2.3 A4-A5, Construction process stage, information modules

- A4, transport to the construction site
- A5, installation

6.2.4 B1-B5, use stage, information modules

- B1, use, *not relevant*
- B2, maintenance
- B3, repair
- B4, replacement
- B5, refurbishment

6.2.5 B6-B7, use stage, information modules related to operation

- 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

This PCR is valid for all piping system for use for sewage and storm water that are in correspondence with the standard EN 476.

The functional unit (cradle to grave) is:

100 meters of piping system (pipes, fittings, manholes etc.) for sewage, and storm water over the course of 100 years (under gravity).

Results should be displayed per functional unit based on scenarios for construction process stage, use stage and end of life stage, see clause 6.2.

6.3.2 Declared unit – only for the pipes

The declared unit (cradle to gate) is:

One piece of pipe with a defined diameter and length for sewage and storm water.

6.3.3 Reference service life

Service life has to be defined in compliance with EN15804 or as minimum based on verified European statistic data for the considered piping system component. The service life of the system shall be 100 years.

6.3.4 System boundaries

The life cycle stages for pipes for sewage and storm water are shown in figure 1. See also Fig. 1 in standard EN 15804.

The different life cycle stages for piping systems for sewage and storm water are shown in Figure 1. The environmental impact shall be documented for each of the life cycle stages and in total.

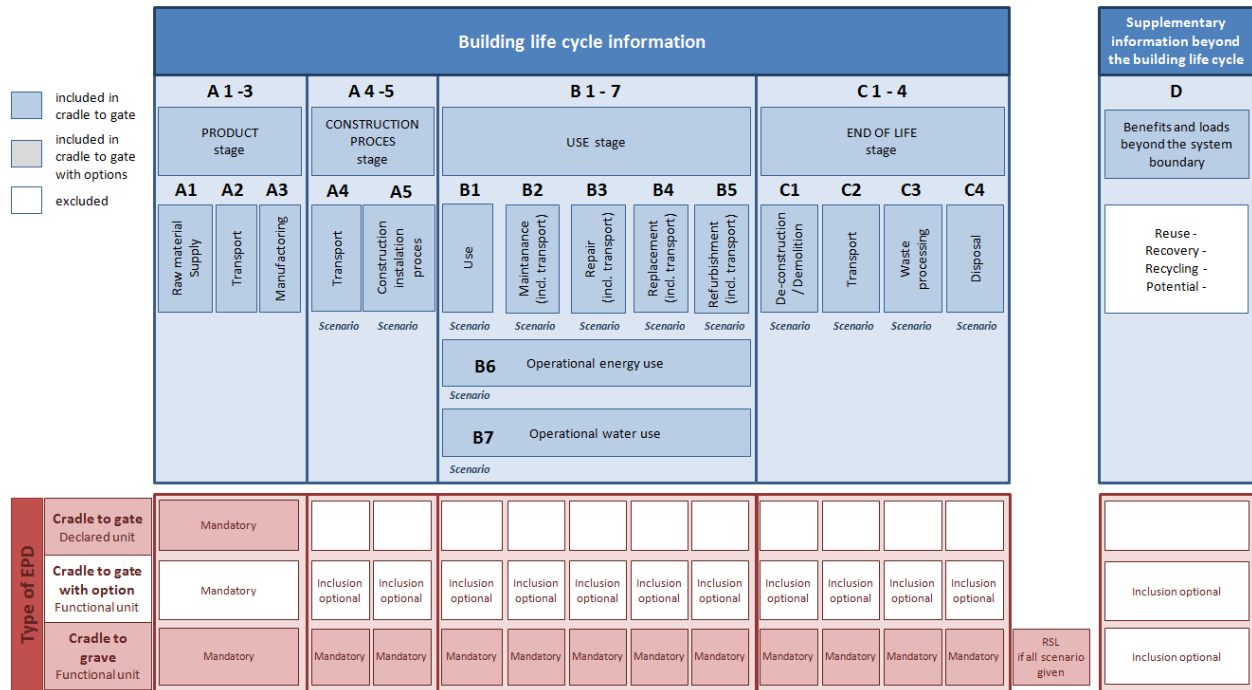


Figure 1 Life cycle stages for piping systems for sewage and storm water

The LCA shall include the joints of piping systems.

6.3.4.1 General

Specification of the boundaries of the Piping systems for sewage and storm water 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.

6.3.4.2 Product stage

- A1 Extraction of new materials, reuse of materials from previous systems, processing of secondary materials
- A2 Transport
- A3 Production of ancillary products (joints, fasteners, screws etc.), manufacturing of products (pipes, fittings and manholes) and co-products, manufacturing of packaging.

6.3.4.3 Construction stage

- A4 transport to trench
- A5 storage of products including provision of heating and cooling, not relevant waste, waste processing, installation of the product system including ancillary products and energy required for installation.

6.3.4.4.2 Use stage

- B1 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, and transport of waste of the refurbishment.

6.3.4.4.3 Use stage information modules related to the operation of the building

- 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
- 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 and loads that have not been allocated as co-products and that have passed end-of-waste state

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.

In addition the following rules should be applied:

- For manufacturing of the product system (pipes, fittings and manholes), 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.
- 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.
- 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 (ISO 14044:2006, clause 3.4.3.4.3)

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

Resource use (material and energy) shall be reported according to EN 15084: 2012, table 1.

6.5 Impact assessment

The characterisation factors in the European Reference Life Cycle Database (ELCD) provided by the European Commission 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 CO₂ 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 SO₂ equivalents
- Eutrophication potential, EP in kg (PO₄)³⁻ equivalents
- Formation potential of tropospheric ozone photochemical oxidants, POCP, in kg C₂H₄ equivalents.
- Abiotic depletion potential for non-fossil fuels in Sb equivalents¹
- Abiotic depletion potential for fossil resources in MJ, net calorific value.²

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.

¹⁻²The indicator describing the depletion of abiotic resources is subject to further scientific development. The use of this indicator is intended to be reviewed during the revision of the Standard EN 15804: 2012.

- Non hazardous waste (kg)
- Radioactive waste (kg)

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.

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 or volume. Generic data may be used for emission factors from the transportation vehicle.

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 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 or volume. Generic data may be used for emission factors from the transportation vehicle.

Raw materials extraction phase

This phase includes extraction of raw materials, raw materials processing. Specific data shall be as a main rule used. Generic data may be used where specific data is impossible to obtain. If EPD exist for included product or material from same Programme Operator and/or with a valid verification, data from the EPD must be used.

Necessary functions such as jointing systems shall be included.

Transport from extraction to production site is included in the raw materials extraction stage. More information about transportation can be found in clause 6.2.6.5.

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.

This life cycle phase covers production of the piping system components: pipes, fittings, inspection chambers/manholes, sealing rings, etc.

Specific in-site data shall be used for production of the piping system components. It should preferably be annual approximate values from the previous year, allocated on the declared product through weight percentage of production volume.

In absence of specific data, generic data shall be used with regard to the production of electricity, materials and semi-finished goods used and with regards to transport. If site-specific data cannot be obtained, grid mix for the relevant country shall be used. The national electricity mix shall be documented.

The environmental impact shall be allocated on weight in relation to total production, unless another allocation method is more appropriate. Machinery/capital goods for production are not included in the LCA. Reject/waste from production shall be accounted for, both as additional raw material extraction and waste handling of the reject.

7.3.2.2 A5, Installation

Installation of piping systems for sewage and storm water shall be in accordance with this PCR and with EN 15804: 2012, clause 7.3.

The installation phase includes all materials and activities connected to installation of the piping systems at location, excavating a trench of 100 m, placing the components according to requirements and backfilling of the trench. This includes use of machines, transportation, lifting equipment and energy and fuel consumption of machinery.

Personnel activities and transport of personnel shall not be included, as well as environmental impact from production of capital goods. Database data may be used for machinery.

The installation phase of the piping systems shall be in accordance with existing standards such as:

- Excavated trench according to relevant national or international standard.
- Testing of piping systems according to EN 1610: 1998.
- Installation of piping systems should be carried out according to the Piping system manufacturers Guidance for installation, national standards/regulations or international standards/regulations.

The requirements for the installation are dependent on usage of the piping system, pipeline diameter, and the numbers of pipes in one trench, the location of trench and the material of the piping system. To avoid allocation problems the installation scenario, and to obtain comparability of EPDs, the installation scenarios defined as **one pipe installed in a trench**, where the volume of the trench and refilling of mass shall follow the requirement demanded by the strength of the pipe material according to the relevant

country's requirements. The volume of the trench and the amount of use of local mass and gravel shall be documented. If the EPD deviates from the predefined scenario, this shall be clearly stated and justified.

Where local mass cannot be used, production and transport of gravel shall be included, in addition to transport of the local mass to landfill.

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

Calculation of volume of trench and trench layers

This clause shall be in accordance with national rules and regulations.

Activities to include in the laying stage/predefined scenario:

- Excavation of the volume of the trench (the intersection area of trench x 100 m). The fuel consumption of the excavated volume shall be defined.
- Transport of excavated mass (that are not reused) from installation location. A transport distance shall be defined. Where density of excavated mass is not known, a density of 2000 kg/m³ may be used in the calculation. If other density is assumed, this shall be stated and justified in the EPD report.
- For production of gravel, database data may be used. Where density of gravel is not known, a density of 1800 kg/m³ shall be used as basis for calculation. If other density is assumed, this shall be stated justified in the EPD.
- Transport of gravel to installation site. A transport distance shall be defined.
- Refilling of mass (volume of the trench – volume of pipe). The fuel consumption of the excavated shall be defined.
- Compaction of mass shall be included.
- Use of explosives is excluded.

Generic data may be used for emission data from excavation and production of gravel if EPD of gravel does not exist.

7.3.3 B1-B7 use stage

Not relevant.

7.3.3.1 B1-B5 use stage

Not relevant.

7.3.3.2 Reference service life

The description of the reference service life may be based on data collected as average data or at the beginning or end of the service life. The reference conditions for achieving the declared technical and functional performance and the declared reference service life shall include the reference service life data. When relevant EN 15804: 2012, Table 10 should be applied. The reference service life shall be documented, justified and explained.

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

The use stage includes maintenance of 100 meters of piping system during 100 years. Energy required to transport water in the piping system (pumps etc.) is excluded from the LCA because the piping system is based on gravity.

Flushing or cleaning activities of the pipes during the operation stage may be excluded from the analysis, as the activity is assumed to have minor impact on the total results. However, if hazardous or toxic materials are operation for cleaning, the activity shall be included.

It is assumed that replacements or repairs of pipes not will be necessary during the course of 100 years. However, to conduct a full LCA of the product it might be taken into account replacements or repairs. This must be well documented, justified and explained.

7.3.4 End of life stage

The most likely options when a pipe has reached its end of life will be:

- Excavation and replacement with new pipes (the excavation process is allocated to the new pipe's installation stage).
- Renovation of pipelines and extension of the service life.
- The pipes are left in the ground.
- Recycling of the piping system component in an identified industry of recycling (metal scrap, plastic etc.)

It is assumed that the most likely end of life scenario will be that the pipes are left in the ground after use. Environmental impacts due to this shall be documented. If other "end of life scenarios" is more probable, this may be included but shall be documented properly.

All transportation distances shall be included.

Generic data may be used for emission factors from the relevant transportation vehicle and documented in the EPD report.

7.4 Additional environmental information

An EPD for piping systems used for sewage and storm water shall include the following information related to environmental issues, in addition to the environmental information derived from LCA.

7.4.1 Indoor environment impact

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 piping system 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, with exception of A1, A2 and A3 that may be aggregated.

8 Project report

8.1 General

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. 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, EN15804: 2012 clause 8.

8.2 LCA-related elements of the project report

LCA-related elements shall follow the instructions given in EN 15804: 2012, clause 8.2.

8.3 Documentation on additional information

Documentation of additional information shall be according to EN 15804: 2012, clause 8.2.

8.4 Data availability for verification

Data availability for verification shall follow ISO 21930: 2007, clause 7.4 and 9.1.

9 Verification and validity of an EPD

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.

Approved 20.09.2012, valid until 20.09.2017
Norwegian EPD Foundation, Verification committee

Sverre Fossdal
Panel chairman/Dr. Engineer

Bibliography

1. EN 476:2011 General requirements for components used in drains and sewers
2. PCR 2004: Product category rules for preparing an environmental declaration for Cement, PCR 2004:1.
3. PCR 2005: category rules for preparing an environmental declaration for Concrete, PCR 2005:7.
4. 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.
5. EN 1610: 1998 Construction and testing of drains and sewers
6. Candidate List of Substances of Very High Concern for authorisation,
http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

APPENDIX A1

(informative)

Norwegian conditions and requirements

This appendix describes Norwegian scenarios and other recommendations 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 (recommended) be in accordance to EN 15942 and the presentation template shown in www.epd-norge.no. The EPD shall show which product standard the EPD is based on.

2 Treatment of electricity

The electricity mix used shall be shown in the EPD as emissions of g CO₂ equivalents per kWh or g CO₂ equivalents per MJ.

3 Reference service life

Piping system for storm water shall be planned and constructed for a reference service life of at least 100 years.

4 Key Environmental Parameters

On page one 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 CO₂ equivalents

Total energy consumption in MJ

Chemicals on REACH Candidate list and the Norwegian Priority list and quantity in kg

4.1 Chemicals in the REACH Candidate list and the Norwegian Priority list

Products, which contain substances on the REACH Candidate list in a concentration above 0.1wt%, shall be declared in terms of content of these substances.

Products, which contain substances on the REACH Authorisation List, the REACH Restriction list or the Norwegian Priority list, shall be declared in terms of content of these substances.

If no such substances occur the following statement shall be given in the EPD: "The product contains no substances given on the REACH Candidate list or the Norwegian Priority list".

4.1.1 The REACH Candidate list and the Norwegian Priority list

Substances on the REACH Candidate list and the Norwegian Priority list will be found on,

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

<http://www.miljostatus.no/no/Tema/Kjemikalier/Kjemikalielister/Prioritetslisten/>

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

5 The laying scenario

The laying scenario shall be based on Norwegian conditions given in NS 3420 and EN 1610

The chosen scenario shall be documented in the EPD report. The recommendation from the manufacturer shall be followed.

Bibliography

1. NS 3420: 2010: Collection of all standards within the NS 3420 series - Specification texts for building, construction and installations
2. Vegbygging normal 018: 2005, Statens vegvesen