

Product category rules

EN 15804 +A2

NPCR 020

Part B for concrete and
concrete elements

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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 (2021-08-xx)	Type	Description of change
		Version 3.0 (ed.) EPD-Norway Secretariat References to EN15804+A2 included References to new PCR part A included
		Version 2.0
		Issued 2018-10-07
		Version 1.0
		Original version, issued 2017-04-07.

2023.10.17 the validity has been extended until 2024.07.01

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Introduction

These product category rules (PCR) are intended for companies preparing an environmental product declaration (EPD) for concrete and concrete elements (see chapter 6.1 for a definition of the product group). The PCR for concrete and concrete elements consists of two parts.

This document contains PCR part B for concrete and concrete elements, which is the part of the PCR that is specific for concrete and concrete elements products. Part A contains the requirements that are common for all construction products. When preparing an EPD for concrete and concrete elements, 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 June 2017 to January 2018, by a Norwegian PCR work group (WG) with representatives from the concrete and concrete elements industry, and with aid from Ostfold Research (Østfoldforskning), SINTEF Building and Infrastructure and the EPD program operator The Norwegian EPD Foundation. An editorial revision according to EN 15804:2012 + A2:2019 was performed by The Norwegian EPD Foundation secretariat in June 2021.

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1 Scope

This document complements the core rules for the product category of construction products as defined in EN 15804: 2012 + A2:2019 and , NPCR part A, and the product category rules for concrete and concrete elements in EN 16757. This PCR is intended to be used in conjunction with those standards.

The intended application of these product category rules (PCR) is to give guidelines for the development of environmental product declarations (EPD) for concrete and concrete elements; either cradle to gate, 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 based on this document.

This PCR applies to concrete and concrete elements for building and civil engineering works, and excludes autoclaved aerated concrete.

Within the construction works context, a cradle to grave declaration delivers a more comprehensive understanding of the environmental impacts associated with concrete and concrete elements.

2 Normative references

NPCR Part A: Construction products and services. Ver. 2.0. March 2021. Oslo: EPD-Norge.

EN 16757:2017 Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements

NS-EN 1992 Eurocode 2: Design of concrete structures

3 Terms and Definitions

As in PCR part A and EN 16757.

4 Abbreviations

As in PCR part A and EN 16757.



5 General Aspects

5.1 Objective of this PCR

As in PCR part A and EN 16757.

5.2 Types of EPD in respect to life cycle stages covered

As in PCR part A and EN 16757, including the following additions:

As a minimum, cradle-to-gate with options that also includes module A4 is required according to this PCR. For concrete elements information modules A5 and C1-C4 are required in addition.

5.3 Comparability of EPD of construction products

As in PCR part A and EN 16757.

5.4 Additional information

As in PCR part A and EN 16757.

5.5 Ownership, responsibility and liability for the EPD

As in PCR part A and EN 16757.

5.6 Communication format

As in PCR part A.

6 Product Category Rules for LCA

6.1 Product Category

As in PCR part A and EN 16757, including the following additions:

The product category referred to in this PCR includes concrete and concrete elements for building and civil engineering works. The most common applications are as follows:

1. Structural concrete or concrete elements (exterior) (e.g. wall elements, columns, beams, balconies and stairs)
2. Structural concrete or concrete elements (interior) (e.g. slab elements, wall elements, columns, beams and stairs)
3. Non-structural elements for buildings (exterior) (e.g. non-load-bearing façades and roof tiles)
4. Non-structural elements for buildings (interior) (e.g. wall elements, terrazzo tiles and sinks)
5. Structural concrete or concrete elements for civil engineering works (e.g. beams, columns, box culverts and sleepers)
6. Elements for street works (e.g. Sound barriers and kerb paving blocks)
7. Non-structural elements for agricultural construction works (e.g. floor slats for livestock)
8. Other concrete and concrete elements for building and civil engineering works

6.2 Life cycle stages and their information modules to be included

6.2.1 General

As in PCR part A and EN 16757, including the following clarification:

The system boundary shall contain as a minimum, life cycle modules A1-A3, A4 for concrete products, and life cycle modules A1-A3, A4-A5 and C1-C4 for concrete element products.

6.2.2 A1-A3, Product stage, information modules

As in PCR part A and EN 16757, including the following addition:

It is important to clarify whether the substance entering the production process under study is classified as a “waste” or as a “secondary product”, i.e. secondary material or secondary fuel. See ISO 21930:2017 for further specification.

6.2.3 A4-A5, Construction process stage, information modules

As in PCR part A and EN 16757.

6.2.4 B1-B5, Use stage, information modules

As in PCR part A and EN 16757.



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

As in PCR part A and EN 16757.

6.2.6 Benefits and loads beyond the system boundary, information module

As in PCR part A and EN 16757.

6.3 Calculation rules for the LCA

6.3.1 Functional unit

As in PCR part A and EN 16757, including the following clarification:

The functional unit shall be defined in such a way that it reflects the product's capacity to fulfil the performance requirements concerning construction, such as requirements for thermal insulation, sound insulation, fire resistance, etc. for a defined RSL (see section 6.3.3).

In this way, quantification of both the qualitative and quantitative aspects of the functional unit have to be performed.

The functional unit for a cradle to gate EPD with options and/or cradle to grave EPD is defined as:

Composite products, e.g. sandwich elements

1 m² of composite product including additional constituents or products installed at the construction site which fulfils the performance requirements concerning construction for a defined RSL. The product and insulation thickness should be documented.

Massive reinforced products

1 tonne of concrete including additional constituents or products which fulfil the performance requirements of the construction installed at the construction site for a defined RSL.

Roof tiles

The amount of roof tiles sufficient to cover 1 m² of roof covering which fulfils the performance requirements concerning construction installed at construction site for a defined RSL. Tile dimensions (mm) and quantity of tiles (kg/m²) per functional unit should also be documented.

Paving blocks

The quantity of paving blocks sufficient to cover 1 m² which fulfils the performance requirements

of the construction installed at construction site for a defined RSL. Paving block dimensions (mm) and quantity of paving blocks (kg/m²) per functional unit should also be documented.

For project specific EPDs:

The amount of concrete and reinforcement to fulfil the performance requirements given in the clients brief.

All requirements used to define the functional unit shall be declared. Depending on the application, a corresponding conversion factor to convert mass to area or volumetric use shall be declared where relevant; e.g. for hollow core slab and wall elements.

Technical specifications shall be declared as specified in PCR Part A.

6.3.2 Declared unit

As in PCR part A and EN 16757, including the following clarification:

The declared unit shall be applied if no functional unit can be defined, e.g. because a function of the product cannot be unequivocally described or because it can be used in many ways within the context of construction works, or when the precise function of the product or scenarios at the building level is not stated or is unknown.

The declared unit is used for concrete when the system boundary includes only information modules A1-A4, see section 5.2.

The declared unit is:

1 m³ of concrete

Depending on the application, a corresponding conversion factor such as the density to convert volume to mass use shall be declared.

6.3.3 Reference service life (RSL)

As in PCR part A and EN 16757.



6.3.4 System boundaries

6.3.4.1 General

As in PCR part A and EN 16757.

6.3.4.2 Product stage

As in PCR part A and EN 16757.

6.3.4.3 Construction stage

As in PCR part A and EN 16757, including the following additions:

When the EPD for ready mixed concrete or site mixed concrete is to be used to declare module A5 at building level, construction and installation processes of ready mixed concrete shall also include the following:

- the steel reinforcement and other products used to achieve the completion of the functional unit (only for Functional Unit, not for Declared Unit);
- any process linked to the placing of concrete (e.g. pouring, pumping, vibrating) or processes linked to the use of the steel or other product;
- any processes linked to energy use for curing of concrete;
- any temporary works needed (e.g. formwork, falsework). Account shall be taken of the reuse of temporary works by dividing any impacts by the number of uses;
- any loss occurring during this stage;
- land filling, disposal and processing (up to the end-of-waste stage) of any output from this stage of the product system (A5) which reaches the end-of-waste state;
- any other process and material included in the scenarios assigned to this stage (see under 6.3.8).

When module A5 is declared for precast concrete elements the following shall be included:

- concrete and other products (glue, expanding sealant, etc) used to finalise the assembly or installation of precast concrete elements. any process linked with these products (e.g. pouring, pumping, vibrating, curing of concrete, excavation, welding) or with formwork used on site as part of the Declared / Functional Unit;
- use of any equipment to lift, erect, and fix precast concrete elements in place on site;
- any loss occurring during this stage;
- land filling, disposal and processing (up to the end-of-waste stage) of any output from this stage of the product system (A5) which reaches the end-of-waste state.

— any other process and material included in the scenarios assigned to this stage (see under 6.3.8).

6.3.4.4 Use stage

As in PCR part A and EN 16757.

6.3.4.5 End-of-life stage

As in PCR part A and EN 16757.

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

As in PCR part A and EN 16757.

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

As in PCR part A and EN 16757.

6.3.6 Selection of data

As in PCR part A and EN 16757 with the following additions:

Specific EPD data for cement and reinforcement shall be used in EPDs, and it shall be stated which plant specific concrete mix design is used to make the assessment.

Similarly, it shall be stated whether transport is based on specific or average data.

6.3.7 Data quality requirements

As in PCR part A.

6.3.8 Scenarios at the product level

As in PCR part A and EN 16757, with the following additions:

6.3.8.1 A4 Transport to the building site

As in PCR part A and EN 16757.

6.3.8.2 Construction stage

As in PCR part A and EN 16757.

6.3.8.3 Use stage

As in PCR part A and EN 16757.

6.3.8.4 End-of-life stage

6.3.8.4.1 General

As in PCR part A and EN 16757 including the following additions:

Figure 1 shows possible scenarios for concrete during the end-of-life stage and for use beyond the system boundary.

In Figure 1 eight different boxes representing the end-of-life scenario for concrete waste are numbered from 1 to 8. See EN 16757 clause 6.3.8.4.1 for specification of these scenarios.

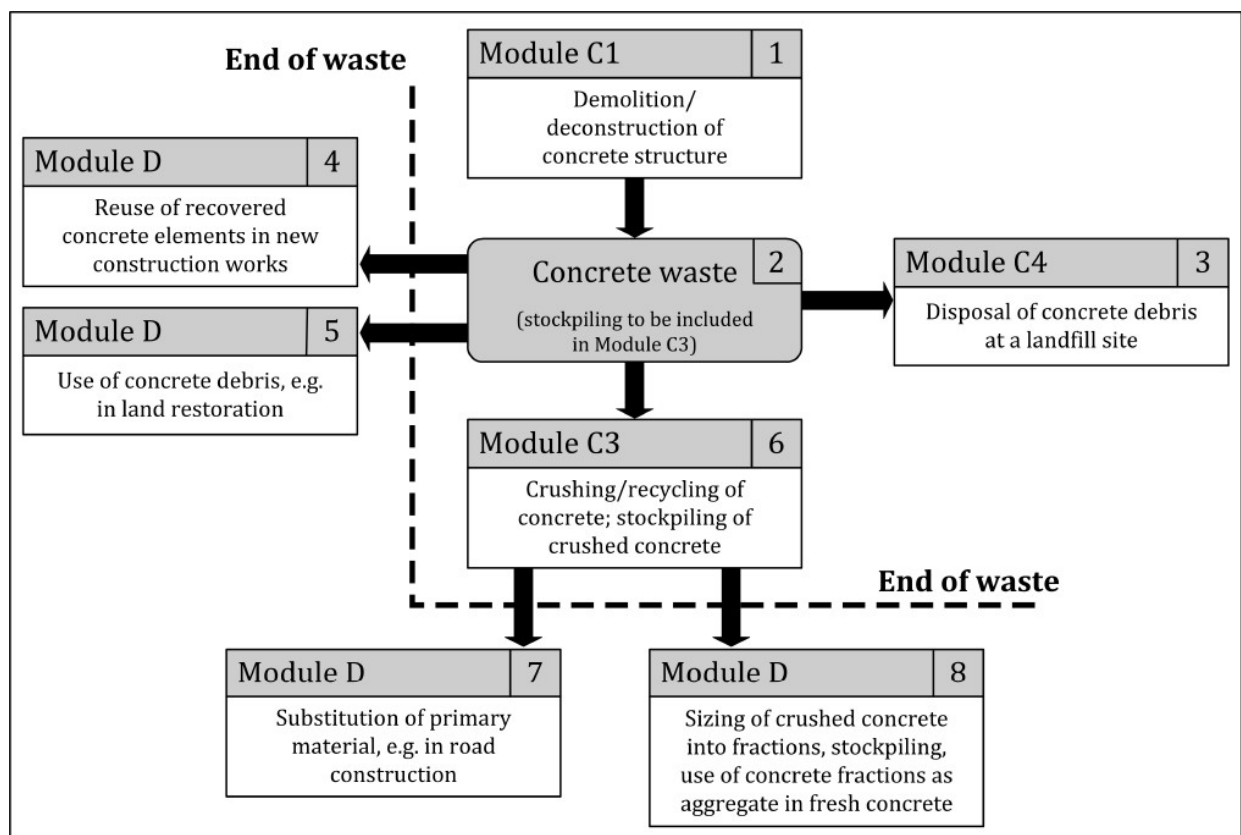


Figure 1 Typical processes during the end-of-life phase of concrete and concrete products including their assignment to life cycle modules C1-C4 and D (transport processes not shown). Source: EN 16757:2017 Figure 5.



6.3.8.4.2 C1, Deconstruction

Typically, concrete structures are demolished, disassembled with demolition excavators, cranes (with wrecking balls or to recover concrete elements) or dismantled with explosives. The environmental loads from the deconstruction scenario, e.g. from the operation of the machinery (fuels, lubricants and emissions) or the use of spraying water, shall be included in life cycle module C1.

6.3.8.4.3 C2, Transport to waste processing

Default scenarios for life cycle information module C2 transport to waste processing should be based on national statistics.

6.3.8.4.4 C3, Waste processing

As in PCR part A and EN 16757.

6.3.8.4.5 C4, Disposal

As in PCR part A and EN 16757.

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

As in PCR part A and EN 16757.

6.3.9 Units

As in PCR part A.

6.4 Inventory analysis

As in PCR part A and EN 16757.

6.5 Impact assessment

As in PCR part A and EN 16757.

7 Content of the EPD

7.1 Declaration of general information

As in PCR part A and EN 16757.

7.2 Declaration of environmental parameters derived from LCA

7.2.1 General

As in PCR part A and EN 16757.

7.2.2 Rules for declaring LCA information per module

As in PCR part A and EN 16757.

7.2.3 Parameters describing environmental impacts

As in PCR part A and EN 16757.

7.2.4 Parameters describing resource use

As in PCR part A and EN 16757.

7.2.4.1 *Water use*

As in PCR part A and EN 16757.

7.2.4.2 *Electricity used in A3 Manufacturing*

As in PCR part A and EN 16757.

7.2.5 Other environmental information describing waste categories and output flows

As in PCR part A and EN 16757.

7.2.6 Accounting of biogenic carbon during the life cycle

As in PCR part A and EN 16757 including the following additions:

7.2.7 Greenhouse gas emissions from land use change

As in PCR part A and EN 16757

7.2.8 Carbonation

As in PCR part A and EN 16757, including the following additions:

Impacts from the use and end-of-life stages of concrete and concrete elements may include the carbonation of concrete. Some precast concrete elements may also include carbonation during the production stage (e.g. induced carbonation from long term storage before delivery).

The quantity of CO₂ bound in concrete varies considerably according to the type of cement and concrete



used, the environmental conditions in use, and the end-of-life scenario.

EN 16757 Annex B provides a possible way to assess carbon dioxide uptake through carbonation in the different life cycle stages depending on the above-mentioned parameters. Other calculation methods may be used if transparently documented.

The carbonation of concrete in concrete and concrete elements shall be reported under the respective modules where it occurs.

7.3 Scenarios and additional technical information

7.3.1 General

As in PCR part A and EN 16757.

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 and EN 16757 including the following additions:

Capacity utilization is calculated as % of the mass carried of the total load capacity of the vehicle. The number given shall be the average of the capacity utilisation on the trip to the construction site and the capacity utilisation on the return trip.

7.3.2.2 *A5, Installation*

As in PCR part A and EN 16757, with the following additions:

Table 2 and 3 give supplementary information for the installation of ready-mix, site-mixed concrete and precast concrete elements.

Table 2 Installation scenario for ready-mix and site-mixed concrete

Parameter	Unit (expressed per functional unit or per declared unit)
Reinforcement ^a ; specify type	kg
Formwork (specify the material, e.g. wood, steel) (Including reuses)	kg
Number of formwork reuses	
Falsework (specify the material, e.g. wood, steel) (Including reuses)	kg
Number of falsework reuses	
Other ancillary materials (specify the material, e.g. demoulding agents, curing agents and/or inserts ^a)	kg
Water use	m ³
Energy use during the installation process ^b ; specified by type	kWh or MJ
Loss of product	kg
Waste; specify type	kg
Output material from waste treatment; specify type and recovery process	kg
Direct emissions to ambient air, soil and water; specify type	kg
^a Only for the functional unit ^b Including the heating of formwork, energy for the crane, pump, other placing device, or vibrators	

Table 31 Installation scenario for precast concrete elements

Parameter	Unit (expressed per functional unit or per declared unit)
Ancillary materials (e.g. connectors, fastenings and/or reinforcing steel); specify type	kg
Ready-mix or cast-in-situ concrete (If relevant)	kg
Formwork and Falsework (specify the material, e.g. wood, steel) (If relevant) (Including reuses)	kg
Number of formwork and/or falsework reuses	
Water use	m ³
Energy use during the installation process ^a ;	kWh or MJ
Loss of product	kg
Waste; specify type	kg
Output material from waste treatment; specify type and recovery process	kg
Direct emissions to ambient air, soil and water; specify type	kg
^a Including energy for the crane, other placing device, heating, tightening or other operations	

7.3.3 Use stage

As in PCR part A and EN 16757.

7.3.4 End of life

As in PCR part A and EN 16757.

7.4 Additional information

As in PCR part A.

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

As in PCR part A.



7.4.2 Additional information on release of dangerous substances to indoor air, soil and water: Soil, ambient air and water

As in PCR part A.

7.4.3 Additional Norwegian requirements

As in PCR part A.

7.4.3.1 Greenhouse gas emissions from electricity use in A3 Manufacturing

As in PCR part A.

7.4.3.2 Dangerous substances and content declaration

As in PCR part A.

7.4.3.3 Emission classification of building materials

As in PCR part A.

7.5 Aggregation of information modules

As in PCR part A.

8 LCA project report

As in PCR part A.

9 Verification and Validity of an EPD

As in PCR part A.

Approved 20.09.2021, valid until 18.10.2023.

Norwegian EPD Foundation, Technical committee

Christopher Skaar

Leader of the Technical committee

10 Bibliography

As in PCR part A, including the following additions:

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

EPD for the best environmental decision



Global
Program
Operator