

Product category rules

EN 15804 +A2

NPCR 024

Explosives and Initiation Systems, ver. 2.0

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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 (2016-03-15)	Type	Description of change
<i>Version 1.0</i>		
Original version, issued 2016-03-15.		
<i>Version 2.0 (ed.)</i>		
Version 2.0 (ed.) EPD-Norway Secretariat References to EN15804+A2 included References to new PCR part A included		

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Table of contents

1 Introduction	5
2 Scope	6
3 Normative references	6
4 Terms and definitions.....	6
4.1 Packaged Explosives	6
4.2 Bulk Explosives.....	6
4.3 Electrical detonators	6
4.4 Non electric detonators.....	6
4.5 Electronic detonators	6
4.6 Plain detonators (fuse caps)	6
4.7 Detonating cords.....	7
4.8 Safety fuse	7
5 Abbreviations.....	7
6 General aspects	7
6.1 Objective of this PCR.....	7
6.2 Types of EPD.....	7
6.3 Comparability of EPD of construction products	7
6.4 Additional information	7
6.5 Ownership, responsibility and liability for the EPD	7
7 Product Category Rules for LCA	8
7.1 Product Category	8
7.2 Life cycle stages and their information modules to be declared.....	8
7.2.1 General.....	8
7.2.2 A1-A3, Product stage, information modules.....	9
7.2.3 A4-A5, Construction process stage, information modules	9
7.2.4 B1-B5, Use stage, information modules related to the use scenario.....	10
7.2.5 B6-B7, use stage, information modules related to the operation scenario.....	10
7.2.6 C1-C4 End-of-life stage, information modules	10
7.2.7 D, Benefits and loads beyond the system boundary, information module	10
7.3 Calculation rules for the LCA.....	10
7.3.1 Functional unit.....	10
7.3.2 Declared unit.....	10
7.3.3 Reference service life (RSL).....	11
7.3.4 System boundaries	11
7.3.4.1 General.....	11
7.3.4.2 Product stage.....	11
7.3.4.3 Construction stage	11
7.3.4.4 Use stage.....	11
7.3.5 Criteria for the inclusion of inputs and outputs (cut-off)	12
7.3.6 Selection of data	12
7.3.7 Data quality requirements	13
7.3.8 Scenarios on product level.....	13
7.4 Inventory analysis.....	13
7.5 Impact assessment.....	13

8 Content of the EPD	13
8.1 Declaration of general information.....	13
8.2 Declaration of environmental parameters derived from LCA.....	13
8.3 Scenarios and additional technical information.....	13
8.4 Additional information	13
8.4.1 Additional information on release of dangerous substances to indoor air, soil, and water	13
8.4.2 Additional Norwegian requirements.....	13
8.5 Aggregation of information modules.....	13
9 Project report.....	13
10 Verification and validity of an EPD.....	14
11 Bibliography	14

1 Introduction

These product category rules (PCR) are intended for companies preparing an Environmental Product Declaration (EPD) for:

- **Explosives**
 - **Packaged Explosives**
 - **Bulk Explosives**
 - **Black Powder**
- **Initiation Systems**
 - **Electrical detonators**
 - **Non electric detonators**
 - **Electronic detonators**
 - **Plain detonators (fuse caps)**
 - **Detonating cords**
 - **Safety fuses**

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 ISO14044: 2006, *Environmental management – Life cycle assessment – Requirements and guidelines* and ISO14025: 2006, *Environmental management – Type III environmental declarations – Principles and procedure*.

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2 Scope

The intended application of this Product Category Rules (PCR) is to give guidelines for development of Environmental Product Declarations (EPD) for Explosives and Initiation Systems and to further specify the underlying requirements of the LCA. The core rules valid for all construction products are given in standard EN 15804, and are expected known by those preparing the EPD.

3 Normative references

NPCR Part A: Construction products and services Version 2.0. Oslo: EPD-Norge and normative references included therein.

4 Terms and definitions

As in PCR part A

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

4.1 Packaged Explosives

Packaged Explosives are manufactured at explosives manufacturing plants and are packaged in suitable and approved boxes, bags or similar before distribution to customers. The packaged explosives may also be packed in smaller inner packaging (eg. plastic or paper cartridges or plastic bags).

4.2 Bulk Explosives

Bulk Explosives are normally manufactured at the blasting location in specially designed Mobile Explosives Manufacturing Units (MEMUs). MEMUs or other suitable vehicles transport raw materials to the relevant quarry, mine or construction site where the explosives are to be used. At the site MEMUs make the bulk explosives and normally pump, auger or blow charge them into the bore holes where they are to be used.

4.3 Electrical detonators

Detonators (also called blasting caps) are used to initiate explosives. Electrical detonators are initiated by use of electrical power through attached electric wires. These detonators can be of an instantaneous type or with a variety of time delays. The time delays are normally controlled by the use of pyrotechnical delay elements inside the detonator.

4.4 Non electric detonators

Non-electric detonators are shock tube detonators. Instead of electric wires (used by electrical detonators), a hollow plastic tube delivers the firing impulse to the detonators, making them immune to most of the hazards associated with stray electrical currents. This type of detonators can also have a variety of time delays normally controlled by the use of pyrotechnical delay elements inside the detonator.

4.5 Electronic detonators

Electronic detonators are fired by use of electric wires like electrical detonators, but the time delay and other built in safety features are controlled by use of electronic components inside the detonator.

4.6 Plain detonators (fuse caps).

Plain detonators (fuse caps) are used to initiate explosives, normally in combination with a safety fuse. Time delays are obtained by using different lengths of safety fuse.

4.7 Detonating cords

Detonating cords consist of a thin flexible plastic/textile tube filled with a suitable explosive such as PETN, RDX or HMX. Cords of different strengths (5-100 grams/meter) are used depending on application. Detonation travels along the detonating cord at high speed.

4.8 Safety fuse

These fuses burn at controlled rates and are typically used to start a detonation in combination with plain detonators (fuse caps). Safety fuses typically consist of a pyrotechnical composition at the core wrapped in a plastic sheeting.

5 Abbreviations

DU	Declared unit
EPD	Environmental product declaration
ESL	Estimated service life
FU	Functional unit
LCA	Life cycle assessment
LCI	Life cycle inventory analysis
LCIA	Life cycle impact assessment
PCR	Product category rules
RSL	Reference service life
ea	Each. A unit of count defining the number of items regarded as separate units.

6 General aspects

6.1 Objective of this PCR

As in PCR part A

6.2 Types of EPD

This PCR cover the following types of EPD

Cradle to gate (A1 - A3) including mandatory **modules A4, A5, C1-C4 and module D, with optional modules B1-B7** or cradle to gate (A1 -A3) with mandatory modules A4 and A5.

The latter is only applicable for products obliterated upon detonation.

6.3 Comparability of EPD of construction products

As in PCR part A

6.4 Additional information

As in PCR part A

6.5 Ownership, responsibility and liability for the EPD

As in PCR part A

7 Product Category Rules for LCA

7.1 Product Category

As in PCR part A, including the following further clarification:

The product group explosives include all types of commercial Explosives and Initiation Systems.

- **Explosives**
 - **Packaged Explosives**
 - **Bulk Explosives**
 - **Black Powder**
- **Initiation systems**
 - **Electrical detonators**
 - **Non-electric detonators**
 - **Electronic detonators**
 - **Plain detonators (fuse caps)**
 - **Detonating cords**
 - **Safety fuses**

7.2 Life cycle stages and their information modules to be declared

7.2.1 General

As in PCR part A, including the following further clarification:

Which modules or life cycle stages to include are dependent on defined type of EPD given in chapter 6.2. All additional technical information is declared in the module, to which it refers (e.g. technical information about the installation and detonation of a product in the stage module A5.)

EPDs based on this PCR include the following life cycle stages or modules as given:

Declared unit, cradle to gate with options for;

- Information modules A1- A3 (mandatory)
- Information modules A4 (mandatory)
- Information modules A5 (mandatory)

The module A5 may be further subdivided:

- A5-1: Installation
- A5-2: Use of explosives - detonation

Declared unit, cradle to gate with options for;

- Information modules A1- A3 (mandatory)
- Information modules A4 (mandatory)
- Information modules A5 (mandatory)
- Information modules B1-B7 (optional)
- Information modules C1-C4 (mandatory)
- Information module D (mandatory)

The module A5 may be further subdivided:

- A5-1: Installation
- A5-2: Use of explosives – detonation

7.2.2 A1-A3, Product stage, information modules

As in PCR part A

7.2.3 A4-A5, Construction process stage, information modules

As in PCR part A, including the following further clarification:

- A4, includes the transport to the site of use.
- A5-1, installation at site of use 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.
- A5-2, use of explosives, detonation of explosives.

The stage A5-1 does not include the drilling of blast holes. This is not covered by this PCR and drilling of blast holes shall not be included in the EPD.

The stage A5-2 includes the part of the life cycle in which the explosives are fulfilling its intended function (detonation), and is therefore mandatory to be included in the EPD.

Emissions to air are based on the chemical reaction from the ideal theoretical composition of the explosive. Weight or volume of released gases from detonation and explosion should be calculated from a balanced chemical reaction, at final state and 1 bar, for the decomposition of the explosive, using stoichiometry and thermochemistry. This calculation is obtained from explosives manufacturers. The inventory analysis of stage A5-2 shall include all substances in table 2.

The values should not be presented as definitive values or fume values/fume tables. The reason is that the use of explosives is dependent on geological and user conditions; the formation of some gases are secondary reactions with air, water and rock around the blast site (and can vary widely from site to site). Substances in table 3 are site specific and are not required to be included in the inventory analysis of stage A5-2. If these are included, it shall be clearly stated which substances have been included and how these have been calculated.

Table 1: Substances that shall be included in the inventory analysis, calculated from a balanced chemical reaction, at final state and 1 bar, for the explosive.

Name	Chemical formula
Carbon	C
Methane	CH ₄
Carbon dioxide	CO ₂
Dihydrogen monoxide (water)	H ₂ O
Nitrogen	N ₂
Sodium carbonite	Na ₂ CO ₂
Other substances may be included if relevant. All substances included shall be stated in the EPD.	

Table 2: Substances that may be included in the inventory analysis. These are formed in secondary reactions with air, water and rock around the blast site (and can vary widely from site to site).

Name	Chemical formula
Carbon monoxide	CO
Hydrogen	H ₂

Name	Chemical formula
Ammonia	NH ₃
Nitrogen Monoxide	NO
Nitrogen dioxide	NO ₂
Oxygen	O ₂

Waste and emissions from rock, soil, etc. (products, material and masses not covered by chapter 4.5, e.g. particles from rock after detonation) to air, land or water may be included in separate calculations. All substances included shall be stated in the EPD.

Module A5-1 and A5-2 may be declared as one aggregated module A5.

7.2.4 B1-B5, Use stage, information modules related to the use scenario

As in PCR part A and relevant c-PCR, including the following further clarification:

Use stage B1-B5 in a building life cycle is not relevant for explosives, detonators or initiation systems.

7.2.5 B6-B7, use stage, information modules related to the operation scenario

As in PCR part A and relevant c-PCR, including the following further clarification:

Use stage B5-B7 in a building life cycle is not relevant for explosives, detonators or initiation systems.

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

As in PCR part A including the following further clarification:

- **Stage C1 includes all activities done prior to transport to final waste treatment, e.g. removal of explosive remaining and waste from packaged explosives, black powder and initiation systems.**
Stage C2 includes transport to final waste treatment.
- **Stage C3 includes processing of waste for reuse, recovery and/or recycling.**
- **Stage C4 includes disposal, i.e. waste handling that does not give a useful product. Examples include landfilling and incineration without energy recovery.**

7.2.7 D, Benefits and loads beyond the system boundary, information module

As in PCR part A

7.3 Calculation rules for the LCA

7.3.1 Functional unit

As in PCR part A and relevant c-PCR, including the following further clarification:

This PCR covers only declared unit with options.

7.3.2 Declared unit

As in PCR part A and relevant c-PCR, including the following further clarification:

Results shall be displayed per declared unit with options:

1 kg of manufactured, installed and used (detonated) product:

- **Explosives**
 - **Packaged Explosives**
 - **Bulk Explosives**
 - **Black Powder**

or

1 ea (detonator) manufactured, installed and used product:

- **Initiation systems**
 - **Electrical detonators**
 - **Non electric detonators**
 - **Electronic detonators**
 - **Plain detonators (fuse caps)**

or

1 meter manufactured, installed and used product:

- **Initiation systems**
 - **Detonating cords**
 - **Safety fuses**

7.3.3 Reference service life (RSL)

As in PCR part A and relevant c-PCR, including the following further clarification:

RSL is not relevant. Explosives and detonators cannot be used several times.

7.3.4 System boundaries

7.3.4.1 General

As in PCR part A.

7.3.4.2 Product stage

As in PCR part A.

7.3.4.3 Construction stage

As in PCR part A and relevant c-PCR, including the following further clarification:

A4: Transport from production gate to site of use.

A5: Amount of product and energy needed for fulfilling the functional unit. Installation and detonation of explosives. This module should include all waste and direct emissions (to air, soil and water) from detonation (use) of analysed product. Weight or volume of released gases from detonation and explosion should be calculated from a balanced chemical reaction for the decomposition of the explosive, using stoichiometry and thermochemistry. This calculation is obtained from explosives manufacturers. See chapter 7.2.3 for description.
Waste and emissions from rock, soil, etc. (products, material and masses not covered by chapter 4.5, e.g. particles from rock after detonation) shall not be included in the calculations.

7.3.4.4 Use stage

As in PCR part A and relevant c-PCR, including the following further clarification:

B1-B7: Use stage B1-B7 in a building life cycle is not relevant for explosives, detonators or initiation systems.

7.3.4.5 End of life stage

As in PCR part A, including the following further clarification:

- C1: Demounting and sorting of remaining of explosives, packaging waste and other waste. Waste and emissions from rock, soil, etc. (products, material and masses not covered by chapter 4.5) shall not be included in the EPD.
- C2: Transport from site of use to waste processing site including internal transport (describe and justify).
- C3: Waste processing for reuse, recycling and energy recovery
- C4: Waste disposal

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

As in PCR part A

7.3.5 Criteria for the inclusion of inputs and outputs (cut-off)

As in PCR part A.

7.3.6 Selection of data

As in PCR part A, including the following further clarification:

Table 3— Application of generic and specific data. Source: EN 15804 (modified).

MODULES	Module A1-A3		A4	A5	B1-B7	C1-C4
	Production of commodities, raw materials	Product manufacture	Transport of products	Installation processes and detonation of explosives	Not relevant	End-of-life processes
Process type	Upstream processes	Processes the manufacturer has influence over	Downstream processes			
Data type	a) EPD-data b) Specific data c) Generic data ¹	Manufacturer's average or specific data	Generic data	Generic data for installation. Weight or volume of released gases from detonation and explosion should be calculated from a balanced chemical reaction for the decomposition of the explosive, using stoichiometry and thermochemistry. This calculation is obtained from explosives manufacturers.	Generic data	

¹ See CEN/TR 15941 "Sustainability of construction works — Environmental product declarations — Methodology for selection and use of generic data".

7.3.7 Data quality requirements

As in PCR part A.

7.3.8 Scenarios on product level

As in PCR part A including the following further clarification:

The Installation and detonation stage includes the part of the life cycle in which the explosives is fulfilling its intended function (detonation).

Weight or volume of released gases from detonation and explosion should be calculated from a balanced chemical reaction for the decomposition of the explosive, using stoichiometry and thermochemistry. This calculation is obtained from explosives manufacturers.

7.4 Inventory analysis

As in PCR part A.

7.5 Impact assessment

As in PCR part A.

8 Content of the EPD

8.1 Declaration of general information

As in PCR part A.

8.2 Declaration of environmental parameters derived from LCA

As in PCR part A.

8.3 Scenarios and additional technical information

As in PCR part A

8.4 Additional information

As in PCR part A

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

As in PCR part A

8.4.2 Additional Norwegian requirements

As in PCR part A.

8.5 Aggregation of information modules

As in PCR part A.

9 Project report

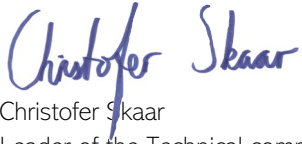
As in PCR part A.

10 Verification and validity of an EPD

As in PCR part A.

Approved 20.11.2021, valid until 20.11.2023.

Norwegian EPD Foundation, Technical committee



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11 Bibliography

As in PCR part A

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