PCR

Passive fiber optical network components for communication services

Version 1.1

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Changes made:

13 February 2024 text changes to installation scenario, clarification that amount of excess soil transportation is calculated per kilometer of cable.

CONTENTS

Introduction

This document provides Product Category Rules (PCR) for Environmental Product Declarations (EPD) for **passive fiber optical network components for communication services**. It complements the core product category rules for all construction products and services as established in EN 15804 and the Dutch horizontal PCR for construction products "Bepalingsmethode milieuprestatie bouwwerken 1.1"[1].

European Standard EN 15804 provides core product category rules for all construction products and services. It provides a structure to ensure that all Environmental Product Declarations (EPD) of construction products, construction services and construction processes are derived, verified and presented in a harmonized way.

An EPD communicates verifiable, accurate, non-misleading environmental information for products and their applications, thereby supporting scientifically based, fair choices and stimulating the potential for market-driven continuous environmental improvement.

This PCR was developed from June 2021 to may 2023, by a Dutch PCR work group within NLconnect, with representatives from the fiber optical industry.

Members of the PCR working group:

Amadys (Netceed)	Patty	van	Broekhoven
Attema	Michel		Schwarz
BAM Telecom	Jop	van	Veen
Circet	Peter		Zijderveld
Compose/Legrand	Huug	van der	Meeren
Dura Line	Ronald		Hendriks
Eurofiber	Jeroen		Kanselaar
Genexis	Olivier	van	Duuren
Glaspoort	Heleen		Lamers
Maunt	Maarten		Verbunt
Netways Europe	Luc		Niggebrugge
NLconnect	Mathieu		Andriessen
Odido	Christina		Rieke
Prysmian Group	Frank		Middel
TKF	Henk		Woldhuis
TriNed	Paul	van	Wanrooij

LCA consultants: NIBE BV, Atakan Larcin and Mantijn van Leeuwen.

1 Scope

This document provides general Product Category Rules (PCR) for Type III environmental declarations for passive fiber optical network components for communication services, this includes components such as cables, duct systems, handholes, racks and shelves, closures and wall boxes, patch cords and pigtails and optical fiber connectors. This PCR intents to cover all passive components from point of light signal entry to point of light signal delivery of the optical fiber network[2]. The PoP is not covered by this PCR. Typically the PoP is a prefabricated concrete or steel construction and these are covered by other PCR's.

[1] Available from the website www.milieudatabase.nl. Document is originally in Dutch, an English translation is available on the website. https://milieudatabase.nl/en/downloads/download/135/

[2] Transformation from light signal to electronic signal takes place in active components of the optical fiber network. Active components are covered in a separate PCR (ref). Active components are network components that consume energy (electricity).

Environmental declarations are used to assess the environmental performance of construction works. Another function of environmental declarations is to assess the environmental performance of products in purchasing or contracting.

This standard is intended to be used in conjunction with the Dutch standard “Bepalingsmethode milieuprestatie bouwwerken 1.1” (provided by Stichting Nationale Milieudatabase through their website www.milieudatabase.nl). The Bepalingsmethode complements the core rules for the product category of construction products as defined in EN 15804 and is intended to be used in conjunction with EN 15804.

2 Normative references

The following documents, in whole or in part, are referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- EN ISO 14025, Environmental labels and declarations — Type III environmental declarations — Principles and procedures (ISO 14025:2006)
- EN ISO 14044:2006, Environmental management — Life cycle assessment — Requirements and guidelines (ISO 14044:2006)
- EN 15804, Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products
- Bepalingsmethode Milieuprestatie bouwwerken v1.1

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15084:2019 apply.

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
GWP	Global Warming Potential
MTBF	Mean time between failures
CPE	customer Premises equipment
PoP	Point of Presence

5 General Aspects

5.1 Objective of this general PCR for optical fiber products for communication services

An EPD according to this document provides quantified environmental information for optical fiber cables and other passive fiber optical network components for communication services on a harmonized and scientific basis. It also provides information on emissions to soil and water during the use stage of the product. The purpose of an EPD in the construction sector is to provide the basis for assessing buildings and other construction works and identifying those which cause less stress to the environment

5.2 Types of EPD with respect to life cycle stages covered

Bepalingsmethode applies[3]

5.3 Comparability of EPD for construction products

Bepalingsmethode applies

5.4 Additional information

Bepalingsmethode applies

5.5 Ownership, responsibility and liability for the EPD

Bepalingsmethode applies

5.6 Communication format

Bepalingsmethode applies

[3] The Bepalingsmethode numbering of the chapters and paragraphs differs in the sense that all chapters of the EN 15804 are part of chapter 2 of the Bepalingsmethode. E.g. paragraph 5.1 of the EN 15804 is 2.5.1. in the Bepalingsmethode

6 Product Category Rules for LCA

6.1 Product category

Bepalingsmethode applies

6.2 Life cycle stages and their information modules to be included

6.2.1 General

Bepalingsmethode applies

6.2.2 A1-A3, Production stage

Bepalingsmethode applies

Optical fiber cables are placed in the ground for a significant time period. Care is needed to avoid that harmful chemicals are leached to the ground or groundwater. To provide transparency the producers will declare any use of substances that are listed in the “Candidate List of Substances of Very High Concern for authorization” when their content exceeds the limits for registration with the European Chemicals Agency. This declaration will be part of general information in the EPD.

Often components of products are purchased ready made from third parties. In that case the transportation of the raw materials to the production location may not be known specifically. The use of “market for” processes from EcoInvent is required in such cases.

6.2.3 A4-A5, Construction process stage

Bepalingsmethode applies

For installation of the optical cable a default scenario is provided as follows[4]:

Trench Excavation
A trench of 30 cm by 70 cm will be excavated with the use of a small digger (1,5-2 ton digger). Due to obstacles in the urban area speed of excavation is limited and ranges from 30 to 120 meter per day. As an average we use 100 meter per day in the default scenario. Estimated use of 5 hours of the 1,5-2 ton digger for excavation of 100 meters is assumed. A 1,5-2 ton digger has a diesel consumption of 10 liter per hour. Thus total diesel consumption is 50 liter for excavation of 100 meter, thus 0,5 liter per meter installed. As part of the excavation work excess amount of excavated soil needs to be transported for further use elsewhere. On average 1 m3 of soil needs to be transported[5] (per kilometer of placed cable) on average over a distance of 15 kilometer. With a density of 2.000 kg/m3 for soil, this equals a transport scenario of 30 t.km transport. This should be added to the excavation scenario. The excavation scenario of the trench is allocated to the duct system, in case of blowing in application. In case an EPD is published for cables for direct placement (without ducts) the excavation scenario should be applied to the cable.

Replacement of street work
After the trench has been closed the street work is placed back, for this an energy consumption of 0,05 liter of diesel is

[4] Installation processes depend on the type of underground. For the default scenario typical Dutch urban installation conditions are assumed.
[5] This amount may be used as estimation. If exact quantity can be calculated from cable volume that may also be used.

assumed per m of duct system. In case an EPD is published for cables for direct placement the scenario should be applied to the cable.

Blowing in of cable
Blowing in of cable is done with a compressor fueled by diesel. Consumption is assumed to be 1.6 liter per hour and 100 m of cable blown in per hour. Diesel consumption of 0,016 liter per meter of cable.

In case of placement in a building instead of underground only the “blowing in of cable” should be applied and not the trench excavation and replacement of street work.

Other activities are carried out with manual labor and do not require energy.

Available environmental profiles (in the National Environmental database) for diesel or other fuels may be applied, as well as available profiles for different stages for the applied equipment (e.g. IIIB, IV or V).

This default scenario may be applied. When specific data are available, e.g. for a specific project or for a specific type of installation, these may be applied instead. Adequate numerical substantiation should be provided in this case.

For waste during construction 15 w% shall be used as default scenario for cables. This is a worst case assumption. When specific information is available this may be used, but adequate numerical substantiation shall be provided in the LCA background report.

For other components than cables 3 w% construction waste[6] shall be used as default scenario, as stated in the Bepalingsmethode. When specific information is available this may be used, but adequate substantiation shall be provided in the LCA background report.

6.2.4 B1-B5, use stage

Bepalingsmethode applies

Duct systems or directly placed, cables are assumed to be leach a negligible amount of substances to the ground or ground water. Although not exactly known they are considered to be well below the cut-off criteria and may be omitted.

No maintenance or repairs are normally required for an installed optical fiber network.

6.2.5 B6-B7, use stage, related to the operation of the building

Bepalingsmethode applies[7]

[6] The products are considered prefabricated products and thus the Bepalingsmethode provides a default scenario of 3 w% construction waste
[7] During use there is a certain amount of signal loss in the network and to compensate for this attenuators are used in the network, depending on the exact local conditions and network design. The attenuators are installed in the PoP. The PoP itself is not covered by this PCR. The operational energy use of the POP is in the Bepalingsmethode not considered to be part of the product EPD or product entry in the central database. The amount of energy needed for attenuation has been estimated using the PSR of the PEP program and was found to be 0,21% of the environmental impact of an optical fiber cable.

6.2.6 C1-C4, End-of-life stage

Bepalingsmethode applies

It is assumed that components of the fiber optical network that are installed underground will stay in the ground after decommissioning of the network. For components that are above ground it is assumed that these will be collected and recycled according to the industry standards. For Cables it is assumed that they will stay in the ground[8]. The Bepalingsmethode provides adequate default scenarios for end of life for the commonly used materials.

6.2.7 D, Benefits and loads beyond the system boundary

Bepalingsmethode applies

6.3 Calculation rules for the LCA

Bepalingsmethode applies

6.3.1 Functional or declared unit

EN 15804 applies

6.3.2 Functional unit

Bepalingsmethode applies

The functional units provided in table 1 shall be used.

Component	Functional unit	Reference service life
Cables	Meter	25 years
Connectivity	piece	25 years
Ductsystem	Meter	25 years
Handholes	piece	25 years
Racks and shelves	piece	25 years
Closures and wall boxes	piece	25 years
Patch cords and pigtails	piece	25 years

Table 1. Functional unit and RLS guidance for optical fiber network components.

In the working group is considered that 25 years is often required as reference service life for underground networks and in our expert opinion can be delivered by current technology.

[8] In case an EPD is made for a Cable system that is not intended for underground installation, but for instance in buildings another end of life scenario would be appropriate.

6.3.3 Declared unit

Bepalingsmethode applies

6.3.4 Reference Service Life (RSL)

Bepalingsmethode applies

The RSL[9] provided in table 1 shall be used.

6.3.5 System boundaries

Bepalingsmethode applies

6.3.6 Criteria for the exclusion of inputs and outputs

Bepalingsmethode applies

6.3.7 Selection of data

Bepalingsmethode applies

6.3.8 Data quality

Bepalingsmethode applies

6.3.9 Developing product level scenarios

Bepalingsmethode applies

6.3.10 Units

Bepalingsmethode applies

[9] A default RSL of 20 years is assumed for optical fiber network components, in line with the RSL for cables as provided in the Guidance for Europacable Members.

6.4 Inventory Analysis

6.4.1 Data collection

Bepalingsmethode applies

6.4.2 Calculation procedures

Bepalingsmethode applies

6.4.3 Allocation of input flows and output emissions

Bepalingsmethode applies

6.5 Impact assessment

Bepalingsmethode applies

7 Content of the EPD

7.1 Declaration of general information

Bepalingsmethode applies

7.2 Declaration of environmental parameters derived from LCA

7.2.1 General

Bepalingsmethode applies

7.2.2 Rules for declaring LCA information per module

Bepalingsmethode applies

7.2.3 Indicators describing environmental impacts based on LCA Assessment

Bepalingsmethode applies

7.2.4 Indicators describing resource use and environmental information based on Life Cycle Inventory (LCI)

Bepalingsmethode applies

7.2.5 Information on biogenic carbon content

Bepalingsmethode applies

7.3 Scenarios and additional technical information

7.3.1 General

Bepalingsmethode applies

7.3.2 Construction process stage

Bepalingsmethode applies

7.3.3 B1-B7 use stage

Bepalingsmethode applies

7.3.4 End-of-life

Bepalingsmethode applies

7.4 Additional information on release of dangerous substances to indoor air, soil and water during the use stage

7.4.1 Indoor air

Bepalingsmethode applies

7.4.2 Soil and water

Bepalingsmethode applies

7.5 Aggregation of information modules

Bepalingsmethode applies

8 Project report

8.1 General

Bepalingsmethode applies

8.2 LCA related elements

Bepalingsmethode applies

8.3 Documentation and additional information

Bepalingsmethode applies

8.4 Data availability for verification

Bepalingsmethode applies

9 Verification and validity of an EPD

Bepalingsmethode applies

10 Bibliography

Bepalingsmethode applies. Additional references:

1. Bepalingsmethode milieuprestatie bouwwerken 1.1, Stichting Nationale milieudatabase, document can be downloaded from www.milieudatabase.nl
2. Carbon performance in the cable industry, Methodologies to assess the Carbon Footprint of organizations and products, Europacable HSE Task Force CARBON FOOTPRINT, Brussels September 2019, Europacable.
3. PSR of PEPecopassport Program, specific rules for Wires, Cables and accessories, PSR-0001-ed4-EN-2022 11 16, 2022 Association P.E.P.