



BSI Standards Publication

Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements

National foreword

This British Standard is the UK implementation of EN 16757:2017.

The UK participation in its preparation was entrusted to Technical Committee B/524, Precast concrete products.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2017
Published by BSI Standards Limited 2017

ISBN 978 0 580 93710 1

ICS 91.100.30

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2017.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

English Version

Sustainability of construction works - Environmental
product declarations - Product Category Rules for concrete
and concrete elements

Contribution des ouvrages de construction au
développement durable - Déclarations
environnementales sur les produits - Règles régissant
la catégorie de produits pour le béton et les éléments
en béton

Nachhaltigkeit von Bauwerken -
Umweltproduktdeklarationen -
Produktkategorieregeln für Beton und Betonelemente

This European Standard was approved by CEN on 11 May 2017.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

European foreword.....	4
Introduction	5
1 Scope	6
2 Normative references.....	6
3 Terms and definitions	7
4 Abbreviations	10
5 General aspects.....	11
5.1 Objective of this PCR	11
5.2 Types of EPD with respect to life cycle stages covered.....	11
5.3 Comparability of EPD for construction products	13
5.4 Additional information	13
5.5 Ownership, responsibility and liability for the EPD	13
5.6 Communication formats	13
6 Product Category Rules for LCA	13
6.1 Product category	13
6.2 Life cycle stages and their information modules to be included	13
6.3 Calculation rules for the LCA.....	15
6.4 Inventory analysis	31
6.5 Impact assessment.....	31
7 Content of the EPD	32
7.1 Declaration of general information.....	32
7.2 Declaration of environmental parameters derived from LCA.....	32
7.3 Scenarios and additional technical information.....	32
7.4 Additional information on release of dangerous substances to indoor air, soil and water during the use stage.....	34
7.5 Aggregation of information modules.....	34
8 Project report	34
9 Verification and validity of an EPD	34
Annex A (normative) Requirements and guidance on the reference service life	35
Annex B (informative) Waste.....	36
Annex C (informative) Characterization factors for GWP, ODP, AP, EP, POCP and ADP	37
Annex AA (informative) Scenarios.....	38
Annex BB (informative) CO ₂ uptake by carbonation — Guidance on calculation.....	43
BB.1 General.....	43
BB.2 Potential CO ₂ uptake for totally carbonated concrete.....	45
BB.3 Use stage, (module B) method of calculation of CO ₂ uptake	45
BB.4 End of life, module C.....	49

BB.5	Beyond the system boundary, module D.....	50
BB.6	Additional information.....	50
BB.7	Regional, national or product specific calculation	50
BB.8	References.....	50
BB.9	Some recent literature on CO₂ uptake.....	51
	Bibliography	52

European foreword

This document (EN 16757:2017) has been prepared by Technical Committee CEN/TC 229 “Precast Concrete Products”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2017, and conflicting national standards shall be withdrawn at the latest by December 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The European Standard EN 15804:2012+A1:2013 provides core 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.

This European Standard provides additional rules for Environmental Product Declarations (EPD) specifically for concrete and concrete elements. It complements the core rules for all construction products and services as established in EN 15804:2012+A1:2013.

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.

The standardization process has taken place in accordance with ISO 14025. All common issues are covered horizontally for all product types in order to minimize vertical (branch specific) deviations. All common issues are covered horizontally for all concrete and concrete elements in order to minimize intra-sectorial deviations.

EPD information is expressed in information modules as defined in EN 15804:2012+A1:2013, which allow easy organization and expression of data packages throughout the life cycle of concrete and concrete elements. The approach requires that the underlying data should be consistent, reproducible and comparable.

In line with EN 15804:2012+A1:2013 the EPD is expressed in a form that allows aggregation (addition) to provide complete information for buildings. This standard does not deal with aggregation at the building level nor does this standard describe the rules for applying EPD in a building assessment.

The standard deals with a limited number of quantifiable parameters as predefined in EN 15804:2012+A1:2013. Future revisions of EN 15804 may lead to the incorporation in this standard of additional predetermined parameters. This European Standard provides the means for developing a Type III environmental declaration of concrete and concrete elements in the context of the suite of standards that are intended to assess the sustainability of construction works.

This suite of standards includes:

- EN 15643-1, *Sustainability of construction works — Sustainability assessment of buildings — Part 1: General framework*
- EN 15643-2, *Sustainability of construction works — Assessment of buildings — Part 2: Framework for the assessment of environmental performance*
- EN 15978, *Sustainability of construction works — Assessment of environmental performance of buildings — Calculation methods*
- EN 15804:2012+A1:2013, *Sustainability of construction works — Environmental product declaration — Core rules for the product category of construction products*
- CEN/TR 15941, *Sustainability of construction works — Environmental product declarations — Methodology for selection and use of generic data*
- EN 15942, *Sustainability of construction works — Environmental product declarations — Communication format - business to business*
- CEN/TR 16970:2016, *Sustainability of construction works - Guidance for the implementation of EN 15804*

1 Scope

This European Standard complements the core rules for the product category of construction products as defined in EN 15804:2012+A1:2013 and is intended to be used in conjunction with that standard.

This European Standard applies to concrete and concrete elements for building and civil engineering, excluded autoclaved aerated concrete.

This document defines the parameters to be reported, what EPD types (and life cycle stages) to be covered, what rules to be followed in order to generate Life Cycle Inventories (LCI) and conduct Life Cycle Impact Assessment (LCIA) and the data quality to be used in the development of EPDs.

In addition to the common parts of EN 15804:2012+A1:2013, this European Standard for concrete and concrete elements:

- defines the system boundaries;
- defines the modelling and assessment of material-specific characteristics;
- defines allocation procedures for multi-output processes along the production chain;
- defines allocation procedures for reuse and recycling;
- includes the rules for calculating the LCI and the LCIA underlying the EPD;
- provides guidance/specific rules for the determination of the reference service life (RSL);
- gives guidance on the establishment of default scenarios;
- gives guidance on default functional units for concrete elements.

This document is intended to be used either for cradle to gate, cradle to gate with options or cradle to grave assessment, provided the intentions are properly stated in the system boundary description.

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

2 Normative references

The following documents, in whole or in part, are normatively 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 206:2013+A1:2016, *Concrete - Specification, performance, production and conformity*

EN 15804:2012+A1:2013, *Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15804:2012+A1:2013 and the following apply.

3.1

environmental product declaration

EPD

fr: déclaration environnementale de produit

de: Umweltdeklaration

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

[SOURCE: ISO 21930:2007]

3.2

concrete

fr: béton

de: Beton

material formed by mixing cement, coarse and fine aggregate and water, with or without the incorporation of admixtures, additions or fibres, which develops its properties by hydration of cement and hydraulic additions as defined in EN 206, as appropriate

[SOURCE: EN 206:2013+A1:2016]

3.3

concrete element

fr: élément en béton

de: Betonelement

part of a construction work made of concrete, either precast or cast on site or a combination of both

3.4

precast (concrete) element

fr: élément préfabriqué (en béton)

de: vorgefertigtes Betonerzeugnis

concrete element cast and cured in a place other than the final location of use (factory produced or site manufactured)

[SOURCE: EN 206:2013+A1:2016]

3.5

precast (concrete) product

fr: produit préfabriqué (en béton)

de: Fertigteil (aus Beton)

product made of concrete and manufactured in accordance with EN 13369 or a specific product standard in a place different from the final destination of use, protected from adverse weather conditions during production

Note 1 to entry: The product is the result of an industrial process under a factory production control system and with the possibility of sorting before delivery.

[SOURCE: EN 13369:2013]

3.6

ready-mixed concrete

fr: béton prêt à l'emploi

de: Transportbeton

- concrete delivered in a fresh state by a person or body who is not the user; or
- concrete produced off site by the user; or
- concrete produced on site, but not by the user

[SOURCE: EN 206:2013+A1:2016]

3.7

site-mixed concrete

fr: béton de chantier

de: Baustellenbeton

concrete produced on the construction site by the user of the concrete for his own use

[SOURCE: EN 206:2013+A1:2016]

3.8

addition

fr: addition

de: Betonzusatzstoff

finely-divided-inorganic constituent used in concrete in order to improve certain properties or to achieve special properties

Note 1 to entry: The addition could be nearly inert (type I), pozzolanic or latent hydraulic addition (type II).

[SOURCE: EN 206:2013+A1:2016]

3.9

admixture

fr: adjuvant

de: Betonzusatzmittel

constituent added during the mixing process in small quantities related to the mass of cement to modify the properties of fresh or hardened concrete

[SOURCE: EN 206:2013+A1:2016]

3.10

aggregate

fr: granulat

de: Gesteinskörnung

granular material of natural, manufactured, or recycled origin used in construction

[SOURCE: EN 12620:2002+A1:2008]

3.11**cement**

fr: ciment

de: Zement

finely ground inorganic material which, when mixed with water, forms a paste that sets and hardens by means of hydration reactions and processes and which, after hardening, retains its strength and stability even under water

[SOURCE: EN 197-1:2011]

3.12**binder**

combination of cement and reactive (type II) additions

3.13**clinker**

main constituent of most cement, made by heating at high temperature a homogeneous mixture of raw materials (mostly limestone and clay)

3.14**polymer fibre**

fr: fibres polymères

de: Polymerfasern

straight or deformed piece of extruded, orientated and cut material, which are suitable to be homogeneously mixed into concrete

[SOURCE: EN 14889-2 :2006]

3.15**steel fibre**

fr: fibres d'acier

de: Stahlfasern

straight or deformed piece of cold-drawn steel wire, straight or deformed cut sheet fibres, melt extracted fibres, shaved cold drawn wire fibres or fibres milled from steel blocks, which are suitable to be homogeneously mixed into concrete

[SOURCE: EN 14889-1:2006]

3.16**reinforcement steel**

steel (wire, strand or bars) subjected to pre- or post-tensioning, and steel (bars, wire, strand, welded mesh fabrics, lattice girder) not subjected to pre- or post-tensioning

3.17**cubic metre of concrete**

fr: mètre cube de béton

de: Kubikmeter Beton

quantity of fresh concrete which, when compacted in accordance with the procedure given in EN 12350-6, occupies a volume of one cubic metre

3.18

truck mixer

fr: camion malaxeur

de: Fahrmischer

concrete mixer mounted on a self-propelled chassis capable of mixing and delivering a homogeneous concrete

[SOURCE: EN 206:2013+A1:2016]

3.19

falsework

fr: étiayement

de: Lehrgerüst

temporary support for a part of a structure while it is not self-supporting and for associated service load

3.20

formwork

fr: coffrage

de: Schalung

structure, permanent or temporary, for containing poured concrete, moulding it to the required dimensions and supporting it until it is able to support itself

3.21

carbonation

fr: carbonatation

de: Carbonatisierung

chemical reaction, a natural process by which carbon dioxide in the ambient air penetrates and reacts with hydration products

3.22

estimated service life

fr: durée de vie estimée

de: voraussichtliche Nutzungsdauer

service life that a building or an assembled system (part of works) would be expected to have in a set of specific in-use conditions, determined from reference service life data after taking into account any differences from the reference in use conditions

[SOURCE: EN 15978]

4 Abbreviations

For the purposes of this document, the abbreviations given in EN 15804:2012+A1:2013 and the following apply.

GGBS Ground Granulated Blastfurnace Slag

PFA Pulverized Fuel Ash"

5 General aspects

5.1 Objective of this PCR

The objective of this PCR is to provide common rules specific for concrete and concrete elements for the application of EN 15804:2012+A1:2013, for building and civil engineering works.

In addition to the objectives of EN 15804:2012+A1:2013 this document aims to:

- define the parameters to be declared and the way in which they are collated and reported;
- describe which stages of a product's life cycle are considered in the EPD and which processes are to be included in the life cycle stages;
- define rules for the development of scenarios, including the rules for calculating the Life Cycle Inventory and the Life Cycle Impact Assessment underlying the EPD, including the specification of the data quality to be applied;
- communicate EPDs and environmental information about concrete and concrete elements;
- ensure that comparisons between construction products are carried out in the context of their use in the building on the basis of the functional unit.

5.2 Types of EPD with respect to life cycle stages covered

EN 15804:2012+A1:2013 shall apply.

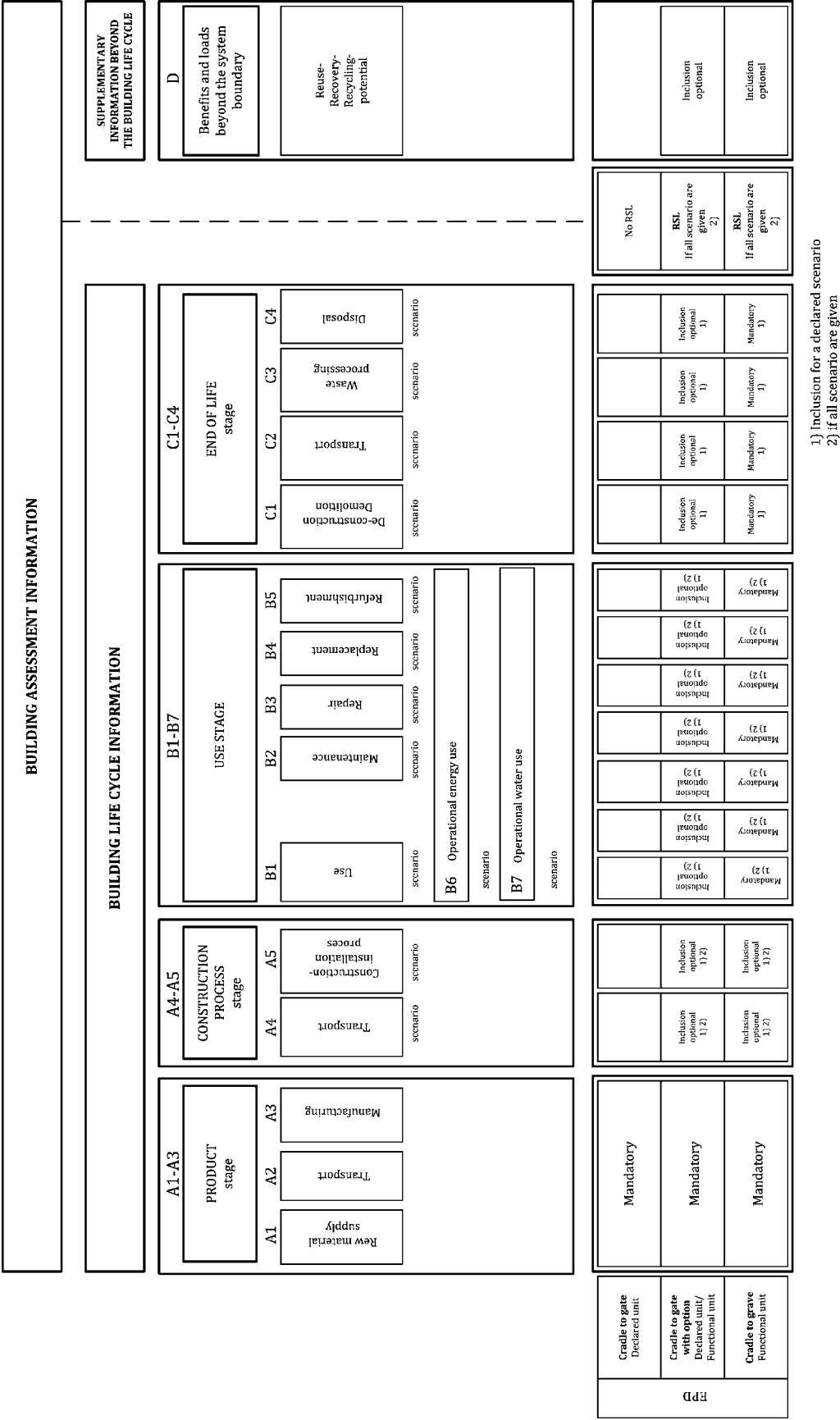


Figure 1 — Types of EPD with respect to life cycle stages covered

5.3 Comparability of EPD for construction products

EN 15804:2012+A1:2013 shall apply.

5.4 Additional information

EN 15804:2012+A1:2013 shall apply.

5.5 Ownership, responsibility and liability for the EPD

EN 15804:2012+A1:2013 shall apply.

5.6 Communication formats

EN 15804:2012+A1:2013 shall apply.

6 Product Category Rules for LCA

6.1 Product category

The product category referred to in this standard includes 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

In addition to the text of EN 15804:2012+A1:2013:

As all life cycle stages (from A1 to C4) shall be included when assessing a construction work (building or civil engineering), it is recommended that EPDs prepared cover the same life cycle, i.e. cradle to grave.

A general description of the life cycle stages is given in Figure 1.

6.2.2 A1-A3, Product stage, information modules

In addition to the text of EN 15804:2012+A1:2013:

NOTE Concrete and concrete elements may contain the following constituents or products (not exhaustive list):

- aggregates;
- cement;
- water;
- admixtures;
- additions;
- fibres;
- reinforcing steel (for precast concrete elements).

When the full LCI of constituents is not available, impact indicators and aspects from the EPDs complying to EN 15804:2012+A1:2013 for the constituents or for ready-mixed concrete, covering modules A1 to A3, can be used for the assessment of module A1 of the concrete or concrete element. If

transport is included, then the impacts and aspects covering modules A1 to A4 can be used for the assessment of modules A1 and A2 (see Figure 2).

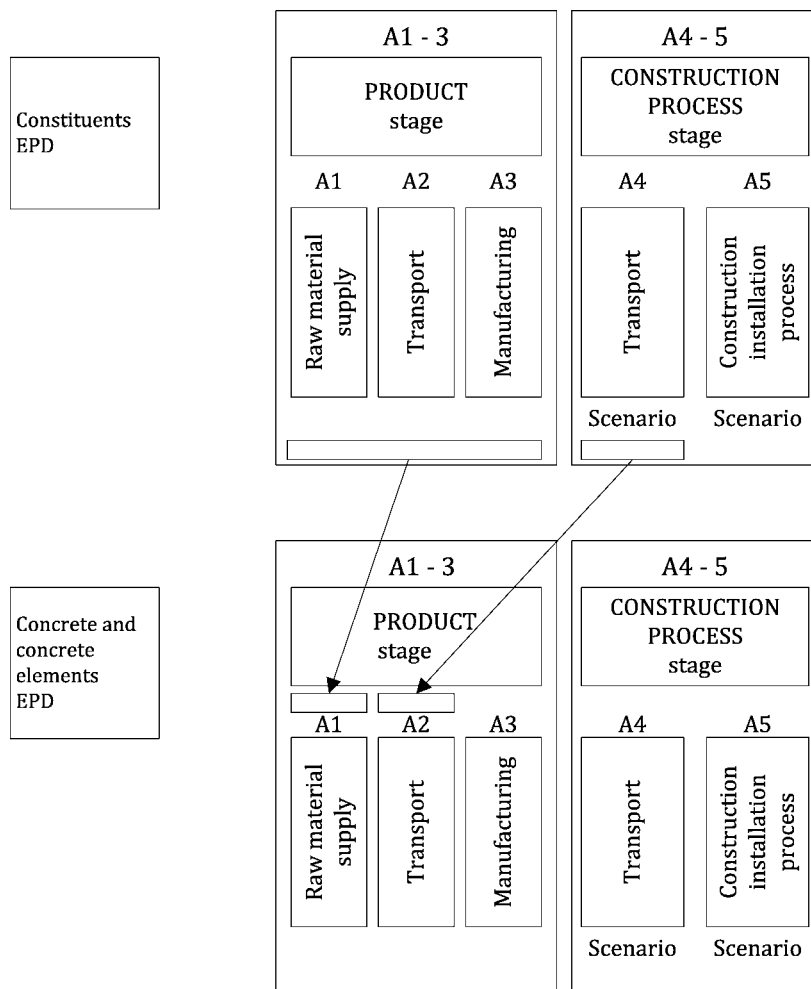


Figure 2 — EPD for constituents (top) and for concrete and concrete elements (bottom)

As an example, for the use of aggregate in concrete, when the EPD of aggregate is used, modules A1 to A3 of the aggregate EPD becomes part of modules A1 of concrete EPD and module A4 of aggregate EPD becomes part of modules A2 of concrete EPD.

6.2.3 A4-A5, Construction process stage, information modules

In addition to the text of EN 15804:2012+A1:2013:

At the construction stage (A5), additional constituents or products may be added to the concrete or concrete element to obtain the defined functional unit; in this case these constituents should be also taken into account during this stage.

EXAMPLE Reinforcing steel, mortar, structural topping, etc.

6.2.4 B1-B5, Use stage, information modules related to the building fabric

EN 15804:2012+A1:2013 shall apply.

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

EN 15804:2012+A1:2013 shall apply.

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

EN 15804:2012+A1:2013 shall apply.

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

EN 15804:2012+A1:2013 shall apply.

6.3 Calculation rules for the LCA

6.3.1 Functional unit

In addition to the text in EN 15804:2012+A1:2013:

The functional unit is based on the function performed by the product in the construction work and on the RSL of the product. It depends on the type of the concrete element. The functional unit is defined in function of the application of the product in the construction work.

Functional units for concrete elements shall give the following information:

- type and dimension;
- intended use;
- main performance characteristics of concrete (e.g. strength class, exposure class in accordance with EN 206) or of concrete element (e.g. load bearing capacity, thermal and acoustic performance);
- reference service life.

NOTE 1 Examples of functional unit are:

1 m² of an exterior load bearing wall or 1 linear metre of a beam with a defined load bearing capacity which fulfils the performance requirements concerning construction, like thermal insulation, sound insulation, fire resistance, etc. for a defined reference service life (see 6.3.3).

NOTE 2 As additional information, the environmental impacts and aspects may be expressed in terms of “impacts and aspects per year of RSL”.

6.3.2 Declared unit

In addition to the text in EN 15804:2012+A1:2013:

Mass may also be expressed in tonnes (1 000 kg).

6.3.3 Reference service life (RSL)

In addition to the text in EN 15804:2012+A1:2013:

When the use of the concrete or concrete element in the building or civil engineering work is known, the RSL of the product shall be consistent with its Estimated Service Life (at least equal to).

When the use is not known the RSL of concrete or concrete element should be assessed by the producer or by the manufacturer for the intended use. Guidance is given in Annex A and Annex AA of this standard.

6.3.4 System boundaries

6.3.4.1 General

In addition to the text in EN 15804:2012+A1:2013:

The general layout of system boundaries may be found in Figures 3 and 4.

Carbonation

The impacts of the use and end-of-life stages may include carbonation of the concrete. Some precast concrete elements may also be subjected to carbonation during production stage (e.g. induced carbonation, long term storage before delivery).

Carbonation is a natural process which occurs during the life cycle of concrete. It shall be considered during the use and the end-of-life stages of the product and may be considered during production stage. For concrete, this means that part of carbon dioxide emitted during cement production is rebound to the concrete during use and end of life stages of a building. As an option, CO₂ absorptions associated with carbonation may be reported at each of these life cycle stages.

The quantity of CO₂ bound varies considerably according to the type of concrete, the environmental conditions in use and the end-of-life scenario.

Annex BB provides a possible method 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.

When CO₂ absorption is not taken into account, this shall be stated on the EPD. When carbonation is taken into account assumptions are specified.

If carbonation is taken into account during the production stage, information on carbonation at all life cycle stages shall be reported.

In Module D, carbonation may be taken into account up to the point of functional equivalence.

6.3.4.5 clearly defines the system boundaries of the end of life stage, in order to distinguish between the benefits within and beyond the system boundaries.

6.3.4.2 Product stage

In addition to the text in EN 15804:2012+A1:2013:

— A1 Production of raw materials or constituent products

For ready-mixed and site-mixed concrete, materials to be taken into account are the constituents of concrete (e.g. cement, aggregates, admixtures, additions, water or fibres as appropriate)

For precast concrete elements, in addition to the constituents of concrete, the production of any other product or system used in the precast concrete element (e.g. steel reinforcement, insulation material) should be taken into account in A1.

— A2 Transport of raw material to the mixing or precast plant

— A3 Manufacturing

The manufacture of ready-mixed or site-mixed concrete may include the following:

- production of ancillary materials used in the mixing plant including, but not limited to, lubricating oils, engine oils, conveyor belts;