

PRODUCT CATEGORY RULES FOR BUILDING RELATED PRODUCTS AND SERVICES

as per ISO 14025 and EN 15804+A2

for preparation of EPDs (Environmental Product Declarations)
according to the EPD programme of the BAU EPD GmbH

Bau-EPD
Baustoffe mit Transparenz



www.bau-epd.at

Part B: Requirements on the EPD for Construction clay products

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Tracking of versions

Version	Comments	Date of changes
6.0	New structure following decisions of TAC from 2017-05-11, adaptations following resolutions from TAC in autumn 2016 and 2017.	2017-08-17
7.0	Changes following decisions of TAC since last publication. Changes on occasion of verification of PCR for concrete and concrete elements as well as resulting from working out the PCR for steel reinforcement. Changes to be made in all PCR B parts as well as some editorial changes. Index now included.	2019-07-06
8.0	Adaptation as per EN 15804:2019+A2:2019; adaptation of rules for declaration of geographical representativity	2020-11-05
9.0	Public version for interested parties after approval of PCR review panel.	2021-01-12
10.0	Consideration of comments, approval for EPD creation	2021-04-07
11.0	Adaptation tables module B and C, minor editorial changes	2021-08-27
12.0	Change ECO Platform logo, note to photographic rights, minor editorial changes (created by SR, checked and approved by FG)	2021-11-27

Note:

Passages in this PCR that originate from the TBE document (see bibliography) are in italics!

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1. Scope

This document contains the **Requirements on an Environmental Product Declaration (EPD)** as per EN 15804 and ISO 14025 and requirements of Bau EPD GmbH.

Dieses Dokument gilt für Bauprodukte aus gebranntem Ton, welche folgenden Produktgruppen zugeordnet werden können:

1. Dachziegel inkl. Formziegel
2. Geschützte Mauerziegel inkl. Formziegel (Hintermauerziegel)
3. Ungeschützte Mauerziegel inkl. Formziegel (Vormauerziegel)
4. Fassadenplatten aus gebranntem Ton
5. Pflasterklinker inkl. Formziegel
6. Deckenziegel und Einhängziegel für Ziegeldecken
7. Kaminziegel
8. Ziegelschalen für Überlager und Deckenträger
9. Ziegelfertigteile, keramische Unterdachkonstruktionen (Sargdeckelkonstruktion)
10. Sonstige Produkte aus gebranntem Ton (Sonderformen etc.)
11. Dämmstoffgefüllte Ziegel

The requirements on the EPD include:

- Requirements from EN ISO 14025
- Requirements on the EN 15804 standard as a European core EPD
- Complementary requirements on EPD of Bau EPD GmbH
- Requirements from the TBE document as of January 21, 2014 of the organization "Tiles and Bricks Europe" created by the Belgian research institute "VITO" (see bibliography).

The calculation rules for the Life Cycle Assessment and Requirements on the project report are specified in a separate document – "Management System Handbook chapter 5" of Bau EPD GmbH.

Requirements on the layout of the EPD

Bau-EPD GmbH determines the following features with regard to the layout of the EPD:

- The document on hand defines the format template for EPD-document that is to fill in (Word file „Format template EPD Bau EPD GmbH“, download at www.bau-epd.at).
- The content of an EPD is not limited in length of text.
- The layout of the front page of the EPD is defined and picture material must be accorded with Bau EPD GmbH (not more than 4 MB).
- On the last page of the EPD the publishing institution as well as the programme operator (Bau EPD GmbH in both cases), the LCA practitioner and owner of the declaration must be indicated with a logo and full address (including telephone number, fax number, email and website).
- Generally the font „Calibri“ must be used.
- In addition to the EPD as Microsoft Word format an Excel-document (BAU EPD M-DOCUMENT 8- excel-file for electronic data transfer Editor baubook ECO Platform) must be created including the result tables for electronic transfer and complying to EN 15942 (ITM Matrix). The templates of Bau EPD GmbH must be used, for these tables also serve to forward data to database owners (ECO Platform/ECO Portal, OEKOBAUDAT and BAUBOOK).

Content of the EPD

The following format template respective guidance describes the required structure of the EPD document including the **required content for each individual chapter**.

In addition to that, this document is giving **specific notes for the creation of an EPD for construction clay products** and **specific LCA calculation rules for construction clay products** that must be considered when creating the EPD and underlying LCA study.

Parts of the content that are considered as additional information of optional character (=not required as per international standard and/or guidelines from ECO Platform) are marked in lilac colour. This information is free to choose whether to declare or not and indications can be delivered by the owner of the declaration on optional basis.

Legend:

- Blue:** required content for each chapter
- Turquoise:** specific requirements for EPD of materials from the scope of the PCR
- Green:** specific LCA rules for EPD of material from the scope of the PCR
- Violet:** additional information of optional character

EPD - ENVIRONMENTAL PRODUCT DECLARATION

As per ISO 14025 and EN 15804



PUBLISHER	Bau EPD GmbH, A-1070 Wien, Seidengasse 13/3, www.bau-epd.at
PROGRAMME OPERATOR	Bau EPD GmbH, A-1070 Wien, Seidengasse 13/3, www.bau-epd.at
OWNER OF THE DECLARATION	Name of declaration owner
DECLARATION NUMBER	To be accorded with Bau EPD GmbH
ISSUE DATE	Date
VALID TO	Date
NUMBER OF DATASETS	Number

Name and description of product

Name of declaration owner

picture

To be accorded with declaration owner
and Bau EPD GmbH

(Note: photographic rights must be
clarified and cited)

Company logo of
declaration owner

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1. General information

Product name Name and description of product	Declared Product / Declared Unit Description of the declared product and declared unit/functional unit
Declaration number To be accorded with Bau EPD GmbH	Number of datasets in EPD Document(s): XX
Declaration data <input type="checkbox"/> Specific data <input type="checkbox"/> Average data	Range of validity The products considered in the data of the life cycle assessment and for which the declaration applies must be named. In the case of an average EPD, this type of EPD must be pointed out. The representativeness of the declaration must be shown with regard to the production volume covered by the life cycle assessment and the technology used. Likewise, the range of fluctuation of the product group considered, must be specified in the interpretation.
Declaration based on: MS-HB version dated dd.mm.yyyy: Name of PCR PCR Code Version (PCR tested and approved by the independent expert committee = PKR-Gremium) The owner of the declaration is liable for the underlying information and evidence; Bau EPD GmbH is not liable with respect to manufacturer information, life cycle assessment data and evidence.	
Type of Declaration as per EN 15804 From cradle to LCA-method: (i.e. Cut-off by classification)	Database, Software, Version Declaration of background database, Software used and both its versions
Author of the Life Cycle Assessment Name of the author Institution, Address website	The CEN standard EN 15804:2014+A1 serves as the core-PCR. Independent verification of the declaration according to ISO 14025:2010 <input type="checkbox"/> internally <input checked="" type="checkbox"/> externally Verifier 1: Name Verifier 2: Name
Owner of the Declaration Name of the manufacturer/owner Institution, Address website	Publisher and Programme Operator Bau EPD GmbH Seidengasse 13/3 1070 Vienna Austria

DI (FH) DI Sarah Richter
 Managing director Bau EPD GmbH

DI Dr. sc ETHZ Florian Gschösser/ N.N.
 chairperson/vice chairperson of expert committee (PCR-Gremium)

Academic Title Name
 Verifier

Academic Title Name,
 Verifier

Note: EPDs from similar product groups from different programmes might not be comparable.

2. Product

2.1 General product description

For the product description the characteristics of the declared product must be described. In case of average EPD ("sector or branch" EPD) all declared products must be described separately.

Indications for the general product description:

- Separate description of products/materials for each product standard applicable, citing the product types and names.
- Description of characteristic components.
- All factory locations for the respective product categories must be declared, alternatively a reference can be made to an overview in an appendix (mandatory information in the project report, voluntary information in the EPD document)

Specific notes for the creation of an EPD for construction clay products:

The declared brick products must be specified according to:

- Product group according to scope
- Product name and, if applicable, designation key for individual declarations
- Description of the product or product group
- Manufacturing process of the construction product
- Surface coating
- System components

If averages are declared for different products, the averaging must be explained, whereby the averaging must be related to a tonnage of fired bricks from the affected plant or plants.

2.2 Application field

The use and application purpose of the named products are to specify. The individual applications (including functions) must be declared as a text or table format.

Specific notes for the creation of an EPD for construction clay products:

The next section provides an overview of the definitions of terms relating to the different product groups of the scope in Chapter 1 and their application (cf. TBE document, pages 16-18).

1. Clay roof tiles and fittings

Clay roofing tiles

Products for discontinuous laying on pitched roofs, and for wall cladding, which are manufactured by shaping (extrusion and/or pressing), drying and firing of the prepared clay, with or without additives. All or part of their surface can be covered with an englobe or glaze.

[EN 1304]

Clay roofing fittings

Products that are complementary to the tiles and have a technical function.

[EN 1304]

2. Protected clay masonry and accessories

Protected masonry

Masonry which is protected against water penetration and is not in contact with soil and ground water.

NOTE It can either be masonry in external walls which is protected, (e.g. by a layer of suitable render or by cladding), or it can be the inner leaf of a cavity wall or it can be an internal wall. It may or may not be loadbearing.

[EN 771-1] - currently under revision in CEN/TC 125

3. Unprotected clay masonry and accessories

Unprotected masonry

Masonry which may be exposed to rain, freeze/thaw and/or may be in contact with soil and ground water without a suitable protection.

NOTE It can either be masonry in external walls which is fully unprotected, or which is intended to be provided by a limited protection (e.g. by a thin layer of render). It may or may not be loadbearing.

[EN 771-1] - currently under revision in CEN/TC 125

Clay masonry unit

Masonry unit made from clay or other argillaceous materials with or without sand, fuel or other additives fired at a sufficiently high temperature to achieve a ceramic bond.

[EN 771-1] - currently under revision in CEN/TC 125

Accessory masonry unit

Masonry unit which is shaped to provide a particular function, e.g. to complete the geometry of the masonry.

[EN 771-1] - currently under revision

Clay masonry units are used for a large variety of applications, and each requires performance levels to be specified. Particular applications are:

4. Clay claddings

Terra cotta wall siding system, including fixing devices where relevant, intended for weather resistance it can also have a decorative purpose. It protects external insulation products and the structure of buildings.

[Adapted from CEN mandate N121]

5. Clay pavers and accessory clay pavers

Clay paver

Unit satisfying used for the surface course of pavements and manufactured predominantly from clay or other argillaceous material, with or without any additions, by shaping, drying and firing at a sufficiently high temperature to form a durable ceramic product.

[EN 1344]

Accessory clay paver

Specially shaped unit intended to fulfil a particular function in the finished pavement. Fittings for use in flexible paving allow completion of the pavement at the perimeter and around obstructions by bonding with pavers laid in a prescribed pattern (e.g. squares, bishops mitre units). Fittings for use with rigid paving being bedded, jointed and pointed in mortar may be used to fulfil functions in both rigid laid paving, such as the provision of surface water drainage, e.g. channel units, or to fulfil particular functions in flexible paving schemes and/or to provide edge restraint for flexible pavements.

[EN 1344]

6. Clay blocks for construction of floor and roof systems

Blocks made in clay, used in conjunction with precast concrete beams in compliance with EN 15037-3, with or without cast-in-situ concrete for the construction of beam-and-block floor and roof systems [EN 15037-3] and clay blocks for use in floors and roofs in conjunction with reinforced concrete with or without in-situ concrete.

[EN XXX in development].

7. Clay blocks for chimney

Technical parameters as per EN 1806.

8. Clay blocks for lintels**Masonry lintel**

Lintel comprising one or more shell casting units completed by the incorporation within the shell casting.

Shell casting unit

Preformed component with one or more channels into which is incorporated either reinforced or pre-stressed concrete.

[EN 845-2]

9. Ceramic roof boarding sarking

Unit used for the supporting structure of roof tiles, manufactured predominantly from clay or other argillaceous materials with or without sand, or other additives fired at a sufficiently high temperature to achieve a ceramic bond.

[UNE 67041]

10. Other baked clay products (special shapes etc.)

Elements for window installation, roller shutters, decorative elements.

11. Insulation filled bricks

Vertically perforated bricks filled with a wide variety of insulating materials.

The description of various areas of application and the graphic representation of the products are taken from Table 21 from Appendix 2 of the TBE document version 05 of 01/21/2014 (pages 82-89).

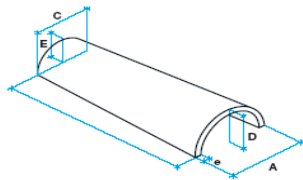
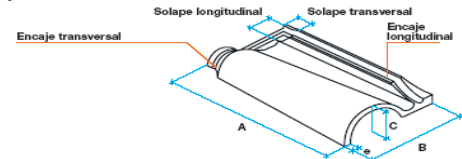
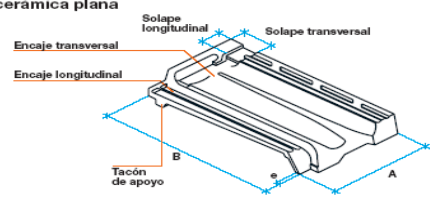

The description of bricks filled with insulating material was supplemented by Bau EPD GmbH.

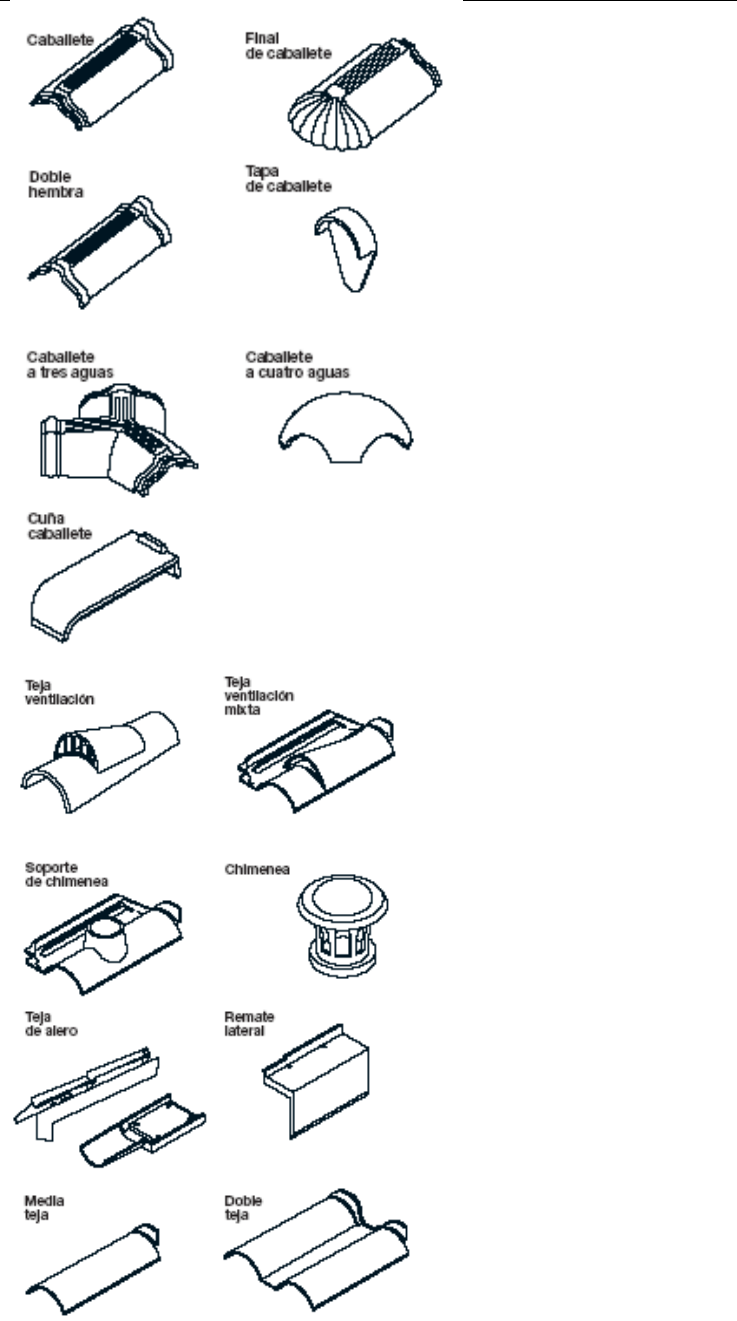
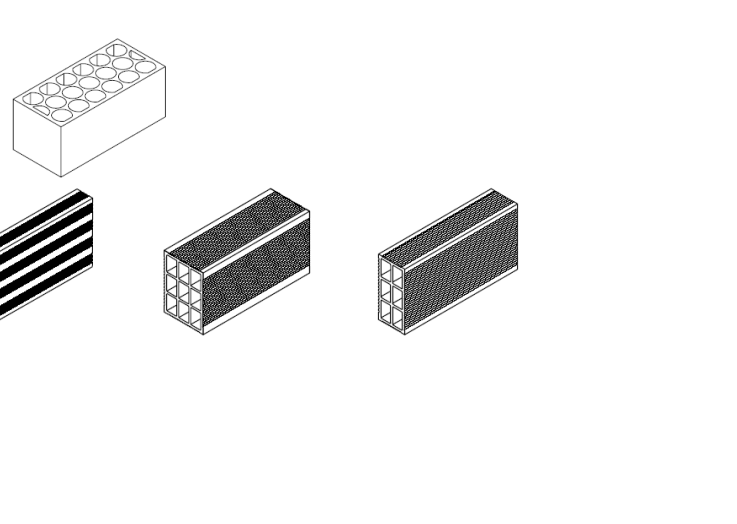
The excerpts can be transferred to the EPD or supplemented or replaced accordingly.

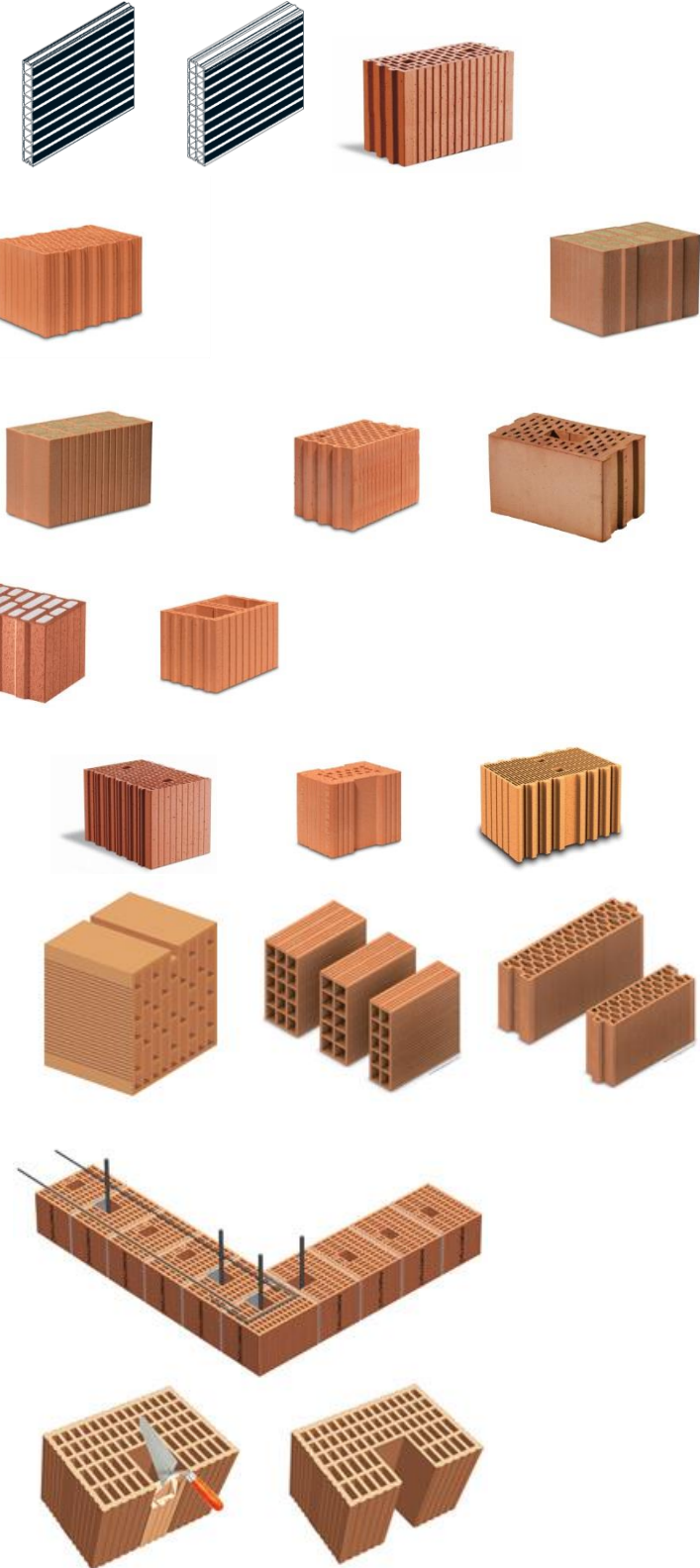
Image description of fired clay building products (according to TBE document, Annex 1, page 82)

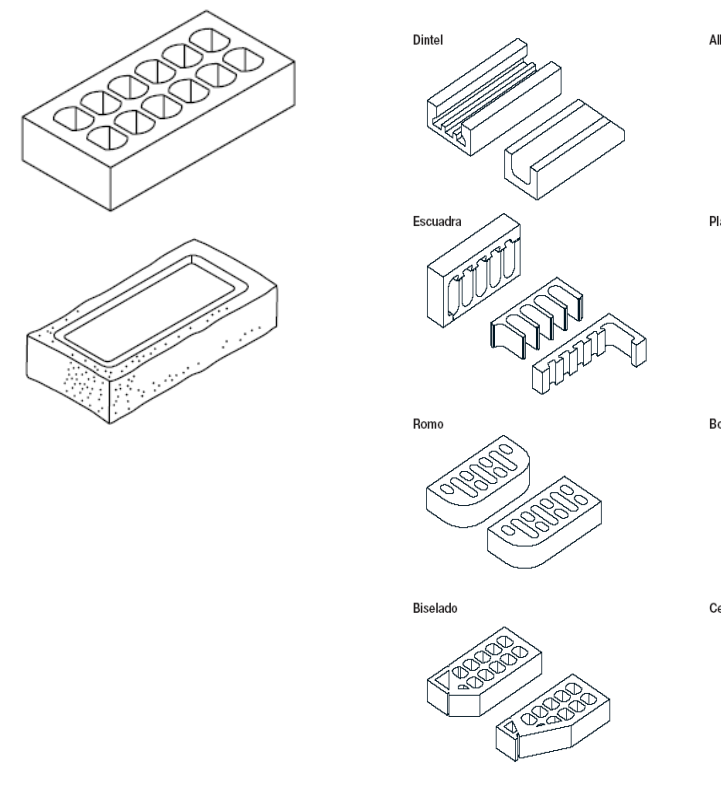
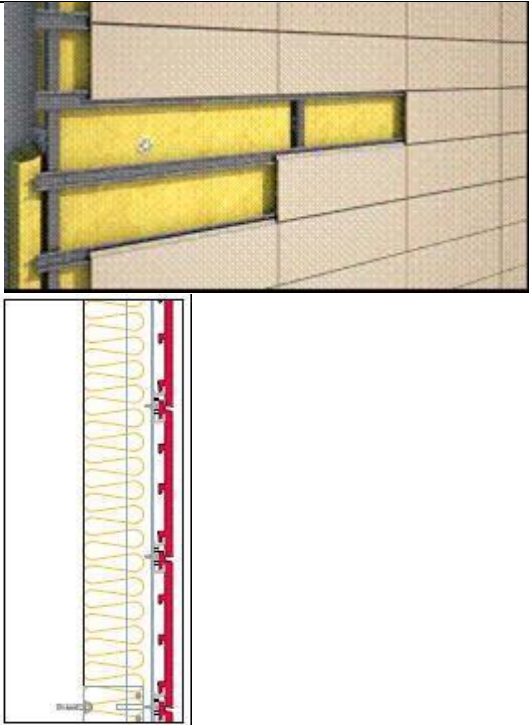
Table 1: Product groups of fired clay construction products

	Clay product, function in buildings and example of functional unit (FU)	Examples of main raw materials used in production	Visual examples
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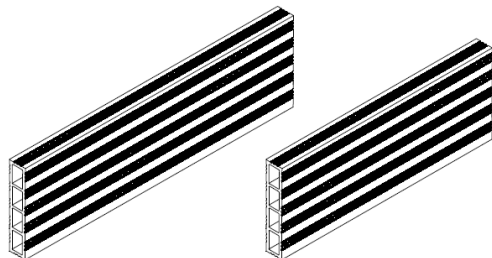
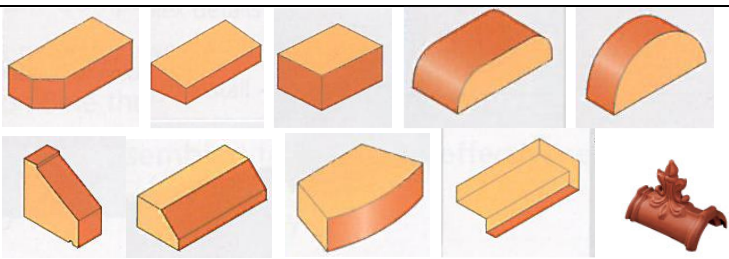
<p>1.</p>	<p>Clay roof tiles</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function; - Weather condition protection; - Aesthetic function. <p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of clay roof tiles".</p>	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials (e.g. glazing precursors and engobes) 	<p>Teja cerámica curva</p>  <p>Teja cerámica mixta</p>  <p>Teja cerámica plana</p>  
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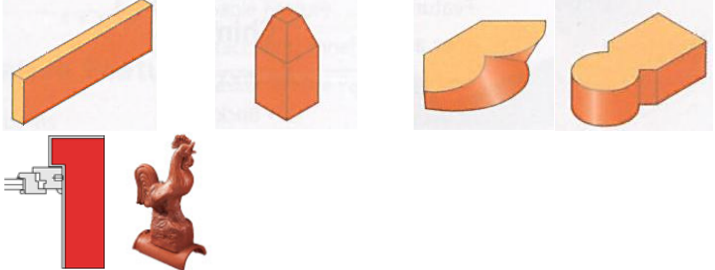

<p>Clay roof fittings and accessories</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function - Weather condition protection - Aesthetic function <p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of clay roof fittings and accessories".</p>	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	
<p>2. Protected clay masonry and accessories</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function and particular function (e.g. to complete the geometry of the masonry) - Weather condition protection 	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	

<p>- Aesthetic function</p>	
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<p>3. Unprotected clay masonry and accessories</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function - Weather condition protection - Aesthetic function <p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of clay product (to be specified)".</p>	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	 <p>Technical drawings of various clay masonry products:</p> <ul style="list-style-type: none"> Hollow brick (top left) Reinforced brick (bottom left) Dintel (top middle) Escuadra (middle left) Romo (middle middle) Biselado (bottom middle) Albardilla (top right) Plaqueta (middle right) Bocel (bottom right) Celosía (bottom right)
<p>4. Clay claddings</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Weather condition protection - Aesthetic function <p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of clay product (to be specified)".</p>	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	 <p>Photograph and cross-section diagram of a clay cladding system showing the installation of clay tiles over a substrate with insulation and a drainage system.</p>

<p>5.</p>	<p>Clay pavers and accessory clay pavers</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function - Weather condition protection - Aesthetic function <p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of clay product (to be specified)".</p>	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	
<p>6.</p>	<p>Clay blocks for construction of floor and roof systems</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function - Weather condition protection - Aesthetic function <p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of clay product (to be specified)".</p>	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	
<p>7.</p>	<p>Clay blocks for chimney</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function - Weather condition protection - Aesthetic function 	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	

	<p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of clay product (to be specified)".</p>		
8.	<p>Clay blocks for lintels</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function - Weather condition protection - Aesthetic function <p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of clay product (to be specified)".</p>	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	
9.	<p>Ceramic roof boarding sarking</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function - Weather condition protection - Aesthetic function <p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of clay product (to be specified)".</p>	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	
10	<p>Other:</p> <p>a) Special shapes</p> <ul style="list-style-type: none"> - For installation of windows - For roof decorations <p><u>Examples:</u> Angle & Cant Bricks Arch bricks Bonding bricks Bullnose bricks Cappings & copings Still bricks</p>	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	

<p>Plinth bricks Radial bricks Shelf Angel bricks Slip bricks Slip bricks Soldier bricks Spiral bricks Universal joint bricks</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function - Weather condition protection - Aesthetic function <p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of clay product (to be specified)".</p>		
<p>b) Special products</p> <p>Elements for roller shutters, blinds, ceilings etc.</p> <p><u>Main function in buildings and in the built environment:</u></p> <ul style="list-style-type: none"> - Structural function - Weather condition protection - Aesthetic function <p><u>Example of FU for this product:</u> "the annual environmental impact related to all life cycle stages of the product* of 1 tonne of product (to be specified)".</p>	<ul style="list-style-type: none"> ▪ clay ▪ sand ▪ additional raw materials 	

<p>Insulation-filled bricks</p> <p>Brick filled with natural perlite or with mineral wool.</p> <p>Main function in the building and in the built environment:</p> <ul style="list-style-type: none"> - Carrying function - Insulation (thermal) 	<ul style="list-style-type: none"> ▪ clay ▪ Sand ▪ Additional raw materials ▪ Insulation materials 	
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<p><i>Example for the functional unit of this product:</i> "The environmental impact related to the entire product life cycle of 1 ton of brick product (without insulation material)" or optionally 1 m³ of product with additional information such as proportion and specification of the filling material and conversion factors according to chapter 4.3.2.</p>		<p>(Picture credits: Bildquellen: Fa. Wienerberger)</p> 
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*All life cycle stages include product stage, construction process stage, use stage, end of life stage and benefits and loads beyond the product system boundary, as detailed in the current PCR.

2.3 Standards, guidelines and regulations relevant for the product

The respective standard and/or general technical approval or comparable national regulation can be indicated.

Optional: Documentation under the frame of CE -certification such as certificates of constancy of performance, certificates of conformity of the internal production control on the manufacturer's site, Declarations of performance, Official certificates of registration, European Technical Assessments or Technical permissions of construction industry can be cited.

Specific notes for the creation of an EPD for construction clay products:

The standards regulating construction clay products must be cited (i.e. standards, guidelines, other regulations)

Examples for product standards for construction clay products in Austria are illustrated in table 2.

Table 2: Product specific standards

Standard	Title
ÖNORM EN 771-1	Specifications for bricks, part 1: bricks

2.4 Technical data

For products carrying a CE marking as per Construction Products Regulation (CPR) the EPD must declare at least the same technical data as required and indicated in the declaration of performance of the manufacturer. What kind of data is required in each individual case is to learn from the document underlying the CE marking: any Harmonized European Standard or European Technical Assessment (ETA).

Additional technical data must be listed if relevant for product distinction or specification.

Specific notes for the creation of an EPD for construction clay products:

Product designation codes of the declared products must be given.

If relevant for the declared product, the following technical construction data in the delivery status must be provided with reference to the testing standard.

Table 3: Technical data of the declared construction product for hollow bricks according to ÖNORM EN 771-1 or declaration of performance according to the Construction Products Regulation (EU) No. 305/2011

Characterization	Unit	Value Range/Performance	Standard
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			From	To	
Dimensions	length	mm	120	500	ÖNORM EN 771-1 / ÖN B 3200
	broad		65	500	
	height		65	500	
tolerances	tolerance	classes	T1, T2, Tm		
	span	classes	R1, R2, R2+, Rm		
shape and training		–	drawing or photo		
brick group		group	1 -3		ÖNORM EN 1996-1
flatness		mm	0	7	ÖNORM EN 772-16
plane parallelism		mm	0	1	ÖNORM EN 772-16
compressive strength	category	Nr.	category I		ÖN EN 771-1
	Declared mean	N/mm²	5	50	ÖNORM EN 772-1
	normalized value	N/mm²	5	50	
	load direction	N/mm²	Vertical		
Usual moisture expansion		mm/m	NPD		ÖNORM EN 772-19
bond strength (shear strength)		N/mm²	0,15	0,3	ÖNORM EN 1052-3
Active soluble salts		class	S0	S2	ÖNORM EN 772-5
reaction to fire		Euro-class	A1		ÖNORM EN 771-1
Fire resistance	Bearing bricks	–	REI 90 REI M 90	REI 180 REI M 180	ÖNORM EN 13501-1
	non-bearing bricks		EI 30	EI 120	
water absorption		%	0	40	ÖNORM EN 772-21
Water vapor diffusion resistance factor μ		–	5/10	50/100	ÖNORM EN 1745
Sound insulation, gross dry bulk density		kg/m³	450	1900	ÖNORM EN 772-13
thermal conductivity λ10 tr		W/mK	0,06	0,9	ÖNORM EN 1745
net dry bulk density		kg/m³	1100	2000	ÖNORM EN 772-13
Durability (frost resistance)		class	F0	F2	ÖNORM EN 772-22 bzw. ÖNORM B 3200
Dangerous substances		Radio-activity	According to National requirement		OIB Guideline ZA3 bzw. ÖNORM S 5200

Average raw density in the present life cycle assessment: XX kg/m³

Description of averaging

Table 4: Technical data of the declared construction product for roof tiles according to ÖNORM EN 1304 or declaration of performance according to the Construction Products Regulation (EU) No. 305/2011

Characterization	Unit	Performance	Standard
type designation	–		
shape and training	–	drawing or photo	
roofing and	Roof and shaped tiles	e.g. plain tiles	ÖNORM EN 1304
exterior wall cladding		Fulfills	
Mechanic solidity (flexural strength)		Meets the requirements	
Behavior in the event of fire reaction to fire	Euroclass	according to OIB guideline Appendix B.4	
waterproofness	requirement level	A1	
	test procedure	1	

Dimensions and dimensional deviations		2	
Durability (frost resistance)	power level	Fulfills	
Release of hazardous substances	radioactivity	Passed	OIB Guideline Anhang B1 bzw. ÖNORM S 5200

Average raw density in the present life cycle assessment: XX kg/m³

Alternatively:

Average area weight in the present life cycle assessment: XX kg/m²

Description of averaging

Optionally, further technical characteristics can be given if they are necessary for the differentiation or the specification of the product(s).

For specific EPD the technical data of the product must be declared as required in Tables 3 and 4.

For average EPD ("Sector or Branch-EPD", "Group EPD" or "EPD from Associations") Tables 3 and 4 must be filled, average values or ranges are accepted, in addition a note stating „see product sheets“ pointing to single technical product sheets can be cited. Technical data must be provided by the manufacturers. The manufacturers are to ensure that the relevant data are accessible, and the LCA-practitioner must indicate the sources where the technical data can be downloaded.

In this case the average value of nominal density/ weight per m² used for calculating the LCA must be declared as an additional information in chapter 3.1.

Partly based on Table 1 from the TBE document, the following information must be found in the background report or the EPD:

2.5 Basic/auxiliary materials

The product components and/or contents and ingredients must be declared in mass-% to enable the user of the EPD to understand the composition and structure of the product in delivery status. These indications shall also support security and efficiency in installation, use and disposal of the product.

The declaration of mass-% can be accurate numbers or a range by analogy with REACH¹. The mass of components that make up less than 1 mass-% of the total product mass can be declared with < 1 mass-%.

The declaration of material product content must list at least those substances contained in the product which are included in the "Candidate List of Substances of Very High Concern for Authorization" where their contents exceed the limit values (0.1 mass-% on product level) for registration by the European Chemicals Agency (ECHA²). If substances and preparations lose their hazardous features during manufacturing (e.g. after a complete chemical reaction) they are exempted from the obligation of declaration.

If the content of the material is below the limit of ECHA the following note must be stated in the EPD:

„The content of XXXX is below the limit values of the registration by the European Chemicals Agency (ECHA). Interpreting statements such as "... free of ..." or "... are entirely harmless ..." are not permissible.

The product components must be described in detail, so that their sort of product is clear, but the protection of sensitive data is assured, and company secrets are not revealed.

For additives, the function and substance class respective chemical group (i.e. hydraulic binders) must be stated. In addition to that all auxiliary materials and additives that stay within the product must be declared.

Table 5: base materials in mass-% (example)

¹ Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

² European Chemicals Agency: <http://echa.europa.eu/de>

Components	Function	Mass fraction in percent
Lehm	main component	

Optional: footnote with description for each component

1) Text

Auxiliaries / additives

Specifications and proportions of excipients are to be stated (in text or tabular format)

2.6 Production

The process of production must be described and illustrated with a simple figure (i.e. flow chart). In case of average EPD the production processes of all sites must be described respective a useful summary must be included and a list of all production sites must be provided in an annex. Quality management systems, eco management systems etc. can be referred to.

Specific notes for the creation of an EPD for construction clay products:

The manufacturing process must be described as in Chapter 2.16, Table 7 (= Table 1 TBE document) under A3.

2.7 Packaging

Information concerning each component of packages:

Type (Foil, pallets, etc.),

Material (Paper, Polyethylene; including origin, e.g. recycled paper) and

Possibilities of reuse (e.g. multi way pallets).

Specific notes for the creation of an EPD for construction clay products:

Example: The construction clay products are delivered on reusable pallets, during transport by truck they are secured several times with reusable straps. Further packaging in the form of foil is not necessary, but can be carried out on request or if necessary. The majority is delivered without foil.

2.8 Conditions of delivery

Written description of conditions of delivery, units of delivery, size and dimension as well as requirements on storage important for the declared product(s).

2.9 Transport

Description of the delivery must be described as in Chapter 2.16, Table 7 (= Table 1 TBE document) under A4.

2.10 Processing/ installation

Description of way of treatment, used machines, tools, dust collection etc., auxiliary materials as well as measures of noise reduction. Notes regarding recognized rules of engineering, work safety or protection of the environment can be included. References to detailed processing directives and referrals to user safety (safe use instruction sheets) of the manufacturer are required.

Specific notes for the creation of an EPD for construction clay products:

Description of these processes taking into account the information in Chapter 2.16, Table 7 (=Table 1 TBE document) under A5. References to rules of technology and work and environmental protection are possible. If processing steps and processing techniques relevant to the environment and health are used in the processing or construction process, they must be listed here. Examples: Use of chemical aids, particularly high water consumption, use of burning materials with the formation of combustion gases, etc.

2.11 Use stage

Notes describing specific features of the material composition relevant for the use stage.

Specific notes for the creation of an EPD for construction clay products:

Bei Bauprodukten aus gebranntem Ton treten bei ordnungsgemäßer Planung, sach- und fachgerechtem Einbau und störungsfreier Nutzung keine Änderungen der stofflichen Zusammensetzung über den Zeitraum der Nutzung auf.

Zusätzliche Informationen können gemäß Kapitel **Fehler! Verweisquelle konnte nicht gefunden werden.**, *Table 7* (= Tabelle 1 TBE Dokument) unter B1 gegeben werden.

2.12 Reference service life (RSL)

The indication of the reference service life (RSL) is imperative for EPDs covering the complete use stage (modules B1-B7), or if a use stage scenario is described, which refers to the lifetime of the product ("from cradle to grave").

The RSL must refer to the declared technical and functional quality of the product. It must be established in line with all of the specific rules in the European product standards and must also take consideration of the ISO 15686-1, -2, -7 and -8 standards.

Where information is available for deriving the RSL from harmonized European product standards, such data has priority.

The assumption underlying the calculation of the RSL and for those only the RSL can be declared must be stated. Influence on aging as per recognized rules of engineering.

Table 6: Reference service life (RSL)

Characterization	value	unit
Product name		years
		years
Reference conditions on which the RSL is based (if relevant)		Individual units

See EN 15804+A2 clause 6.3.4 and Annex A requirements and guidelines for reference service life

If no reference service life can be determined according to the rules of EN 15804+A2 (Annex A), a default value from a complementary PCR of the CEN/TC product committees, if available, must be used. If no complementary PKR is available, the service life can be declared from service life catalogues, depending on the area of application, stating the source, e.g. according to BAU EPD-M-DOKUMENT-20-Reference-usage-times-20150810 (Austria) or the BBSR table "Useful lives of components on life cycle analysis according to BNB" (Germany). If no information can be found there, the RSL can be derived from other sets of regulations (Eurocodes, other basis).

2.13 Reuse and recycling

Beschreibung gemäß Kapitel **Fehler! Verweisquelle konnte nicht gefunden werden.**, *Table 7* (= Tabelle 1 TBE Dokument) unter C3 gegeben werden.

2.14 Disposal

Eine thermische Verwertung von Produkten aus gebranntem Ton ist aufgrund des geringen Heizwerts nicht angebracht.

Vergleiche auch Kapitel **Fehler! Verweisquelle konnte nicht gefunden werden.**, *Table 7* (= Tabelle 1 TBE Dokument) unter C4 gegeben werden.

The different ways of disposal must be described.

The EAK-waste disposal code (Disposal code following the European list of waste) must be declared.

2.15 Further information

Optional details, indication of reference source for additional information, e.g. websites...

2.16 Excerpt from the TBE document Life Cycle Description

For products made of fired clay, only EPDs from cradle to grave are permitted according to the agreement of all brick associations at European level and therefore all modules must be declared (compare TBE document page 49).

- A1 Clay extraction;
- A2 Transport of the clay to the representative roof tile/paver/brick works plant (representative production site);
- A1 The mining and/or production of auxiliary materials;
- A2 Transport of these auxiliary materials to the representative production site;
- A3 The production process (preparation, moulding, drying, firing, packaging);
- A1-3 Waste and waste processing of the production waste
- A3 Manufacture of the packaging materials
- A3 Transport of the packaging materials to the representative production site
- A3 Packaging of the clay products;
- A4 Transport of the packed clay products to the client/yard
- A5 Laying in the building or at pavement;
- B1 Use of the clay products;
- B2-5 Maintenance, repair, replacement and refurbishment of the clay products;
- C1 De-construction and demolition at the end of the reference service life (defined at 150 years);
- C2 Transport to the waste processing plant;
- C3 Waste processing for re-use, recovery and/or recycling;
- C4 Disposal (landfill, incineration).

A summary of all life cycle stages, for various construction clay products, with all modules and flows, within defined boundaries, can be found in Figure 1.

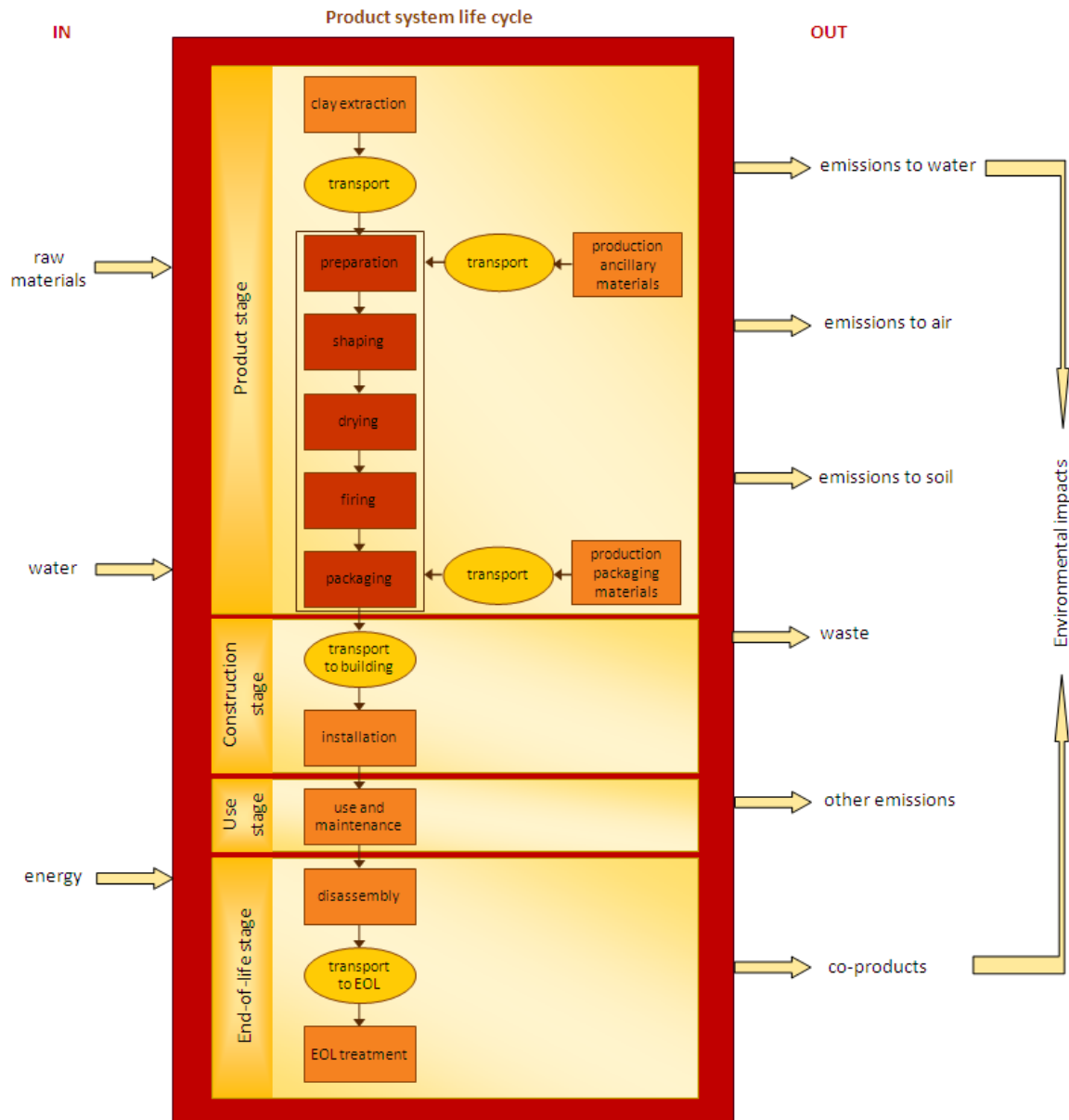


Figure 1: System boundaries for the LCA of clay products from the cradle to the grave

The TBE document shows in Table 1 (pages 26-41) a description of the modules in the left column and, correspondingly, in the right column the calculation for a fired clay product. The table is adopted as information in the Austrian PKR and the products are adjusted accordingly in order to clearly define the system boundaries. Note: In the TBE document, parts that were taken directly from EN 15804 are written in blue. The additions of VITO and TBE are written in black.

Table 7: Information modules and corresponding processes and material flows (TBE document, Table 1), *modified according to the rules of Bau EPD GmbH*

***All modules are covered, but the processes and material flows do not represent an exhaustive list, but are given as examples for orientation.**

Life cycle stages	Information modules and the processes and flows corresponding to their boundaries* as per EN15804	Example of calculation for a generic construction clay product
A1-A3 – Product Stage	<p>A1, raw material extraction and processing, processing of secondary material input (e.g. recycling processes)</p> <ul style="list-style-type: none"> • A1 Extraction and processing of raw materials (e.g. mining processes – clay, sand, loam, auxiliary materials, etc.) • A1 Reuse of products or materials from a previous product system; • A1 Processing of secondary materials used as input for manufacturing the product, but not including those processes that are part of the waste processing in the previous product system; • A1 Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport; • A1 Energy recovery and other recovery processes from secondary fuels, but not including those processes that are part of waste processing in the previous product system; • A1-A3 processing up to the end-of-waste state or disposal of final residues including any packaging not leaving the factory gate with the product. • 	<p>A1, raw material extraction and processing, processing of secondary material input (e.g. recycling processes):</p> <ul style="list-style-type: none"> • Mining process of main raw materials (clay, sand, loam, etc.); <ul style="list-style-type: none"> ○ Make distinction between imported versus local main raw materials ○ Energy needed for the mining process (excavation and conveyor belt) ○ Processing of waste up till the end-of-waste state or disposal of final residues, related to the mining process. Transportation of this type of waste from the mine to the end-of-waste state or final destination must be included. • Production of other raw materials / auxiliary materials (additives like colorants and pigments, glazes, englobes, etc.); <ul style="list-style-type: none"> ○ Inputs: raw materials, water and energy ○ Outputs: emissions to air, water, soil, other emissions, waste, (by)products. • In case recycled materials (secondary raw materials) are used to replace part of the main virgin raw materials (e.g. paper fibres, broken ceramics, etc.), the following processes should be taken into account: <ul style="list-style-type: none"> ○ Avoided production of main principles raw materials (less virgin main principle raw materials needed). ○
	<p>A2, transport to the manufacturer</p> <ul style="list-style-type: none"> • A2 Transportation of raw materials and auxiliary materials up to the factory gate / production site and internal transport; • A1-A3 processing up to the end-of-waste state or disposal of final residues including any packaging not leaving the factory gate with the product. • 	<p>A2, transport to the manufacturer:</p> <ul style="list-style-type: none"> • Transport of the principal raw materials to the production site; <ul style="list-style-type: none"> ○ Make distinction between imported versus local main raw materials; • Transport of the other raw materials/auxiliary materials to the production site (transport of colorants and pigments, glazes, englobes to the production site); <ul style="list-style-type: none"> ○ Make distinction between imported versus local main raw materials; • Transport of secondary raw materials (recycled materials) from the recycling plant to the clay product manufacturer, for instance: paper fibres, broken ceramics, etc. <ul style="list-style-type: none"> ○ Make distinction between imported versus local main raw materials; • For all transport steps the following information should be collected: <ul style="list-style-type: none"> ○ Fuel type consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat etc.; ○ Distance; ○ Transportation mode; ○ Capacity utilization; ○ Bulk density;

		<ul style="list-style-type: none"> ○ Volume capacity utilisation factor.
	<p>A3, manufacturing</p> <ul style="list-style-type: none"> • A3 Production of ancillary materials or pre-products; • A3 Manufacturing of products and co-products; • A3 Manufacturing of Packaging; • A1-A3 processing up to the end-of-waste state or disposal of final residues including any packaging not leaving the factory gate with the product. 	<p>A3, manufacturing:</p> <p>Inputs (energy needed, water consumption) and outputs (waste, and emissions to air, water, soil, and other emissions, (by)products) should be identified for the following steps:</p> <ul style="list-style-type: none"> • Preparation of the principal raw materials (clay/loam/sand) in the clay product plant; • Moulding process; • Drying of clay products; • Firing of clay products; • Packaging of the clay products, including manufacturing of the packaging materials (wooden pallets, plastic foils, etc.) and transport of the packaging materials to the clay products production plant; <ul style="list-style-type: none"> ○ Note: For wooden pallets, it is important in the LCA to reflect the actual weight of the pallets that is used to transport clay products because these amounts can be different from country to country and also in generic databases these amount are different (e.g. Swiss Ecoinvent database, about 30kg). • Storage • Treatment of packaging waste of the raw materials that are used up till the end-of-waste state or disposal of final residues <ul style="list-style-type: none"> ○ For the treatment of packaging waste either country specific scenarios or a European average scenario can be used. ○ For packaging materials the following European scenario for end of life of the package can be used, if no National scenarios are available (EU27 average waste treatment scenario can be applied, as summarized in the table below). This European average situation is applied for the waste scenario for packaging waste in the environmental impact assessment for clay construction products. ○ Transportation of the packaging waste from the production site to the end-of-waste state or final destination should be included. • Treatment of production waste up till the end-of-waste state or disposal of final residues: <ul style="list-style-type: none"> ○ Transportation of this type of waste from the production site to the end-of-waste state or final destination must be included. ○
A4-A5 installation	<p>A4, transportation of the clay product from manufacturer to the building site</p> <ul style="list-style-type: none"> • A4 Transportation from the production gate to the construction site; • A4-A5 Storage of products, including the provision of heating, cooling, humidity control, etc.; • A4-A5 wastage of construction products (additional production processes to compensate for the loss of wastage of products); 	<p>A4, transportation of the clay product from manufacturer to the building site:</p> <ul style="list-style-type: none"> • Transportation of the clay products to the construction site. Make distinction between: <ul style="list-style-type: none"> ○ Export ○ Local / national market <p>As per Table 8 (based on Table 7 of EN 15804), the following information should be collected:</p>

- *A4-A5 waste processing of the waste from product packaging and product wastage during the construction processes up to the end-of-waste state or disposal of final residues;*

In module A4, Table 7 of EN 15804 will be provided as additional technical information to specify the transport scenarios used or to support development of the scenarios at the construction site level

- Fuel type consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat etc.
- Distance
- Transportation mode
- Capacity utilization
- Bulk density
- Volume capacity utilisation factor
- Further assumptions for scenario development

If the transportation of the clay product from the producer to the construction site is a volume limited transportation (amount of cargo on a truck limited by volume and not by weight), allocation shall be based on volume.

For the calculation procedures, we refer to **Fehler! Verweisquelle konnte nicht gefunden werden.** of this PCR.

Below the methodology and example for module A4 is presented:

Transport to the customer (Information module A4)

The average transport distance to the customer for a product from a plant should be defined. If data are available, the distance to the customer can be calculated as follows:

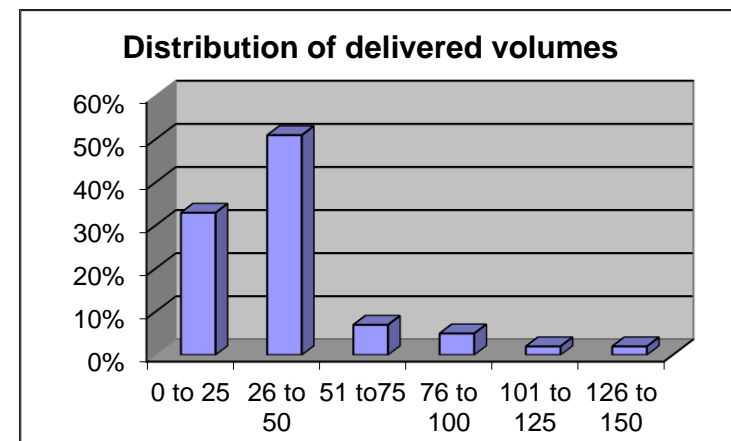
1. Extract from the delivery software the quantity in term of tons delivered to each customer during a given year.
2. Determine the distance between the factory and every customer and explain the type of transportation.
3. Calculate the number of tons delivered for a certain interval, for example each 25 km, until reaching the maximum distance.
4. If a statistical treatment is wanted, draw a bar chart with data expressing the percentage of quantity for each interval.
5. Calculate the mean distance to the customer in km.

For a sector EPD, it is possible to provide the mean value of a representative factory. It is also possible to provide the mean value of several plants.

This scenario only applies to the domestic market.

Example based on the table (including a graph) below, an average transport distance of 49,5 km has been calculated (illustrative example).

Table 1 Illustrative example for calculation of the average transport distance



Distance in km	% of transport
0 to 25	33%
26 to 50	51%
51 to 75	7%
76 to 100	5%
101 to 125	2%
126 to 150	2%

If no specific transport distances are available, default values from national systems can be used.

In addition to this methodology and example, the tables **Fehler! Verweisquelle konnte nicht gefunden werden.** in contain information on national average transport distance.

A5, installation of the clay product into the building

- A4-A5 Storage of products, including the provision of heating, cooling, humidity control, etc.;
- A4-A5 wastage of construction products (additional production processes to compensate for the loss of wastage of products);

A5, installation of the clay product into the building:

- The environmental impact related to the storage of clay construction products at the construction site is considered negligible.
- Treatment of packaging waste of the clay construction products that are used at the construction site up till the end-of-waste state or disposal of final residues
 - For the treatment of packaging waste either country specific scenarios or a European average scenario can be used.

- *A4-A5 waste processing of the waste from product packaging and product wastage during the construction processes up to the end-of-waste state or disposal of final residues;*
- *A5 Installation of the product into the building including manufacture and transportation of ancillary materials and any energy or water required for installation or operation of the construction site. It also includes on-site operations to the product.*

In module A5, Table 8 of EN 15804 will be provided as additional technical information to specify the construction clay product's installation scenarios describing the product's installation at the level of building.

- For packaging materials the following European scenario for end of life of the package can be used, if no National scenarios are available (EU27 average waste treatment scenario can be applied, as summarized in the **Fehler! Verweisquelle konnte nicht gefunden werden.** above). This European average situation is applied for the waste scenario for packaging waste in the environmental impact assessment for clay construction products.
- Transportation of this type of waste from the construction site to the end-of-waste state or final destination should be included.

- The environmental impact as a result of the installation stage is considered negligible compared with impacts in other life stages and taking into account the reference service life of 150 years.
- Losses during construction are defined as x % (additional production processes to compensate for the loss of wastage of products should be taken into account as well as the treatment of the waste related to the clay product during the construction process up to the end-of-waste state or disposal of final residues);
- On-site operations to the clay product are supposed to be manually, no environmental impacts are allocated to the construction process.

The following scenarios for Module A5 can apply as default scenarios for clay construction products:

General

With the exception of the loss of materials (construction waste) the environmental impacts of the construction phase are building specific rather than product specific. Environmental information regarding building site activities (e.g. equipment for the construction site, scaffolding, use of energy and water for handling or warehousing operations etc) should be considered within the overall environmental impact of the construction process and not addressed as part of the environmental impact of the product. Therefore these aspects are usually not declared, or declared as 'not relevant' in a product EPD.

Impacts from the construction activities could mainly derive from:

- Use of raw materials or ancillary materials during construction operations;
- Fuel burning and energy use during internal transportation or; handling operations and equipment energy use;
- Water use and waste water production (water run-off) due to the construction activities;
- Direct emissions to air, soil and water;
- Waste production.

Ceramic building products

If relevant information is available for a specific product, regarding the construction phase, it shall be reported. In general terms, installation of ceramic products at the building site is mainly manually and it requires little or negligible use of energy or water. Storage of clay products at the building site requires no special care apart from normal good health and safety site practice. The nature of the material does not create significant issues when cutting and shaping which do not produce hazardous waste. The unused products deriving from these operations can be recycled within the building site. When this is not possible, it should be counted as construction waste and the total amount shall be reported. If specific data is not available, the following default scenario shall be used: the default values for any loss of materials during the installation phase on the building site is set equal to 3% in mass for blocks, 3% for facing bricks and pavers and 2% in mass for roof tiles.

When ancillary materials are needed to install the product (e.g. mortar or glue for bricks and tiles) the total amount per declared unit should be reported. It is assumed that this information is included in the PCR of the ancillary materials.

Moreover, the below default transport scenarios for the packaging waste together with the scenarios for waste disposal (presented in **Fehler! Verweisquelle konnte nicht gefunden werden.**) should be used in the module A5 (based on Belgium default scenarios) (Source: <http://www.ovam.be/jahia/Jahia/pid/176?actionReq=actionPubDetail&fileItem=2924>).

Table 2 Transportation distance to final destination for the categories wood, plastic and paper waste (Debacker W. et al., 2012)

Type of waste	Transportation distance
Wood waste	From building site to container company or waste processor
	38 km
	From container company to final destination
	Wood pallets return to the factory gate
Plastic	From building site to container company or waste processor
	35 km
	From container company to final destination

		<table><tr><td></td><td>37 km</td></tr><tr><td rowspan="4">Paper and cardboard</td><td>From building site to container company or waste processor</td></tr><tr><td>48 km</td></tr><tr><td>From container company to final destination</td></tr><tr><td>37 km</td></tr></table> <p>As per Table 9 (based on Table 8 of EN 15804), the following information should be collected:</p> <ul style="list-style-type: none">• Ancillary materials for installation (specified by material) of the clay product• Waste materials on the building site before waste processing, generated by the installation of the clay product• Output materials (specified per type) as result of waste processing at the building site (e.g. collected for recycling, for energy recovery, disposal) and specify by route• Direct emissions to ambient air, soil and water• Further assumptions for scenario development		37 km	Paper and cardboard	From building site to container company or waste processor	48 km	From container company to final destination	37 km
	37 km								
Paper and cardboard	From building site to container company or waste processor								
	48 km								
	From container company to final destination								
	37 km								
B1-B7 – use stage	<p>B1, use or application of the installed clay product</p> <ul style="list-style-type: none">• B1 Use of the installed product in terms of any emissions to the environment (not covered by B2-B7) <p>See Additional information of release of dangerous substances to indoor air, soil and water during the use stage (7.4 of EN 15804)</p>	<p>B1, use or application of the installed clay product:</p> <p>The module “use of the installed clay product” covers environmental aspects and impacts arising from components of the building and construction works during their normal intended use, which are assigned to module B1 (in terms of any emissions to the environment and not covered by sections B2 to B7).</p> <p><i>Direct emissions to ambient air, soil and water during the use stage:</i></p> <p>Horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not yet available.</p>							
	<p>B2, maintenance</p> <ul style="list-style-type: none">• B2 The production and transportation of any component and ancillary products used for maintenance, including cleaning;• B2 Transportation of any waste from maintenance processes or from maintenance related transportation;• B2 The end-of-life processes of any waste from transportation and the maintenance process, including any part of the component and ancillary materials removed.	<p>B2, maintenance:</p> <p>Ceramic building products require no maintenance during the use phase and therefore no impacts are declared during the maintenance phase.</p> <p>Clay roof tiles can require occasional inspections to reposition elements, restoring connections and overlaps or to replace single elements damaged for example by extreme atmospheric agents or vandalism. Impacts associated to these operations are very low and considered as negligible. No cleaning is usually needed for clay roof tiles during the RSL of the building. Test research carried out by the Polytechnic University of Marche has shown that the clay roof tiles do not</p>							

	<p>For module B2, Table 9 (B2) of EN 15804 will be provided as additional technical information to specify scenarios used or to support development of the scenarios of this module at the building level.</p>	<p>suffer for the combine effects of UV rays exposure and freeze-thaw cycles and neither any colour change occurs nor any technical feature is lost (e.g. surface absorption capacity).</p>
	<p>B3, repair</p> <ul style="list-style-type: none"> • <i>B3 Repair process of the repaired part of a component including:</i> <ol style="list-style-type: none"> 1) <i>the production of the repaired part of a component and of ancillary materials;</i> 2) <i>use of related energy and water;</i> 3) <i>the production and transport aspects and impacts of any wastage of materials during the repair process;</i> • <i>B3 The transportation of the repaired part of component and ancillary materials, including production aspects and impacts of any waste of materials during the repair related transportation;</i> • <i>B3 The end-of-life processes of any waste from transportation and the repair process, including the part of the component and ancillary materials removed.</i> <p>For module B3, Table 9 (B3) of EN 15804 will be provided as additional technical information to specify the scenarios used or to support development of the scenarios of this module at the building level.</p>	<p>B3, repair:</p> <p>Basically ceramic building products require no repairing during the use phase and therefore no impacts should be declared in module B3.</p>
	<p>B4, replacement</p> <ul style="list-style-type: none"> • <i>B4 The production of the components and of ancillary materials used for replacement;</i> • <i>B4 Replacement process, including related water and energy use and the production aspects and impacts of any waste of materials used during the replacement process;</i> • <i>B4 The transportation of the component and ancillary materials used for replacement, including production aspects and impacts of any losses of material damaged during transportation;</i> • <i>B4 The end-of-life processes of any losses suffered transportation and the replacement process, including the components and ancillary materials removed.</i> <p>For module B4, Table 9 (B4) of EN 15804 will be provided as additional technical information to specify the scenarios used or to support development of the scenarios of this module at the building level.</p>	<p>B4, replacement:</p> <p>Ceramic building products require no replacing during the use phase and therefore no impacts should be declared in module B4.</p>

	<p>B5, refurbishment</p> <ul style="list-style-type: none"> <i>B5 The production of the components and ancillary materials used for refurbishment;</i> <i>B5 Refurbishment process and related water and energy use including production aspects and impacts of any waste of materials used during the refurbishment process;</i> <i>B5 The transportation of the component and ancillary materials used for refurbishment, including production aspects and impacts of any losses during transportation;</i> <i>B5 The end-of-life processes of any losses suffered during transportation and the refurbishment process, including the components and ancillary materials removed.</i> <p>For module B5, Table 9 (B5) of EN 15804 will be provided as additional technical information to specify the scenarios used or to support development of the scenarios of this module at the building level.</p>	<p>B5, refurbishment:</p> <p>Ceramic building products require no refurbishment during the use phase and therefore no impacts should be declared in module B5.</p>
	<p>B6, operational energy use (e.g. operation of heating system and other building related installed services);</p> <p>In module B6, Table 11 of EN 15804 will be provided as additional technical information to specify the scenarios used or to support development of the energy use scenario of this module at the building level.</p>	<p>B6, operational energy use:</p> <p>This module is not relevant for construction clay products.</p>
	<p>B7, operational water use</p> <p>In module B7, Table 11 of EN 15804 will be provided as additional technical information to specify the scenarios used or to support development of the water use scenario of this module at the building level.</p>	<p>B7, operational water use:</p> <p>This module is not relevant for construction clay products.</p>
C1-C4 – End-of-life stage	<p>C1, de-construction, demolition</p> <ul style="list-style-type: none"> <i>C1 deconstruction, including dismantling or demolition, of the product from the building, including initial on-site sorting of the materials;</i> <p>For module C1, Table 12 of EN 15804 will be provided as additional technical information to specify the scenarios used or to support development of the EOL scenarios of this module at the building level.</p>	<p>C1, de-construction, demolition:</p> <p>Taking into account the long reference service life of the clay product (150 years), the reference study period for the building may be shorter than this period. Note: the residual value of the clay products should be taken into account on the building level if the study period is shorter than 150 years.</p> <p>As per Table 12 (based on Table 12 of EN 15804), the following information should be collected:</p>

		<ul style="list-style-type: none">- Collection process specified per type (kg collected separately or kg collected with mixed construction waste);- Recovery system specified per type;- Disposal specified per type;- Assumption for scenario development e.g. transportation.-									
<p>C2, transport to waste processing</p> <ul style="list-style-type: none">• C2 transportation of the discarded product as part of the waste processing, e.g. to a recycling site and transportation of waste e.g. to final disposal; <p>For module C2, Table 12 of EN 15804 will be provided as additional technical information to specify the scenarios used or to support development of the EOL scenarios of this module at the building level.</p>	<p>C2, transport to waste processing:</p> <p>As per Table 12 (based on Table 12 of E 15804), the following information should be collected:</p> <ul style="list-style-type: none">- Collection process specified per type (kg collected separately or kg collected with mixed construction waste);- Recovery system specified per type;- Disposal specified per type;- Assumption for scenario development e.g. transportation. <p>As a general approach, data regarding the transportation distances of the waste are collected for each LCA onsite. However, if this information is not available the distances in the <i>Table 3</i> below can be used for clay construction product EPD development purposes. The data concerning the transportation of construction and demolition waste from building site to its final destination are taken from ASRO (2008).</p> <p><i>Table 3: Distance to final destination for the inert waste category with EPD information module</i></p> <table><tr><th>Transportation distance</th><th>Module</th></tr><tr><td colspan="2">From building site to container company or waste processor</td></tr><tr><td>39 km</td><td>module C for 100% clay products</td></tr><tr><td colspan="2">From container company to final destination</td></tr><tr><td>23 km</td><td>module C for 5% clay products, module D for 95% clay products</td></tr></table> <p>In accordance with EN 15804:2012, waste must be taken into account in module C until the end-of-waste boundary is reached. For the part of clay products that is recycled, this boundary lies at the recycling plant (crushing, etc.). For the part that is not recycled, the entire trajectory to the landfill should be taken into account.</p>	Transportation distance	Module	From building site to container company or waste processor		39 km	module C for 100% clay products	From container company to final destination		23 km	module C for 5% clay products, module D for 95% clay products
Transportation distance	Module										
From building site to container company or waste processor											
39 km	module C for 100% clay products										
From container company to final destination											
23 km	module C for 5% clay products, module D for 95% clay products										

	<p>C3, waste processing for reuse, recovery and/or recycling</p> <ul style="list-style-type: none"><i>C3 waste processing e.g. collection of waste fractions from the deconstruction and waste processing of material flows intended for reuse, recycling and energy recovery. Waste processing shall be modelled and the elementary flows shall be included in the inventory. Materials for energy recovery are identified based on the efficiency of energy recovery with a rate higher than 60 % without prejudice to existing legislation. Materials from which energy is recovered with an efficiency rate below 60% are not considered materials for energy recovery.</i> <p>For module C3, Table 12 of EN 15804 will be provided as additional technical information to specify the scenarios used or to support development of the EOL scenarios of this module at the building level.</p>	<p>C3, waste processing for reuse, recovery and/or recycling:</p> <p>As per Table 12 (based on Fehler! Verweisquelle konnte nicht gefunden werden. of EN 15804), the following information should be collected:</p> <ul style="list-style-type: none">- Collection process specified per type (kg collected separately or kg collected with mixed construction waste);- Recovery system specified per type;- Disposal specified per type;- Assumption for scenario development e.g. transportation. <p>As a general approach, national scenarios for the end-of-life (EOL) stage should be used, if no other data is available. However, if this information is not available, it is proposed to use the European default EOL scenario available, presented in the <i>Table 4</i> below.</p> <p style="text-align: center;"><i>Table 4: European EOL scenarios for clay products</i></p> <table><tr><th>EOL scenario</th><th>Proportion (%)</th></tr><tr><td>Recycling and re-use</td><td>70</td></tr><tr><td>Landfilling</td><td>30</td></tr></table>	EOL scenario	Proportion (%)	Recycling and re-use	70	Landfilling	30
EOL scenario	Proportion (%)							
Recycling and re-use	70							
Landfilling	30							
	<p>C4, disposal</p> <ul style="list-style-type: none"><i>C4 waste disposal including physical pre-treatment and management of the disposal site.</i> <p>For module C4, Table 12 of EN 15804 will be provided as additional technical information to specify the scenarios used or to support development of the EOL scenarios of this module at the building level.</p>	<p>C4, disposal:</p> <p>As per Table 12 (based on Table 12 of EN 15804), the following information should be collected:</p> <ul style="list-style-type: none">- Collection process specified per type (kg collected separately or kg collected with mixed construction waste);- Recovery system specified per type;- Disposal specified per type;- Assumption for scenario development e.g. transportation. <p>As a general approach, national scenarios for the end-of-life (EOL) stage should be used, if no other data is available. However, if this information is not available, it is proposed to use European default EOL scenario, presented in the Table 5. Examples of national scenarios are presented in the tables 6 to 8 above.</p>						

MODUL D	<p><i>D, Gutschriften und Lasten außerhalb der Produktsystemgrenze, Informationsmodul</i></p> <ul style="list-style-type: none"> <i>D, Wiederverwendung, Rückgewinnung und /oder Recycling Potenziale, ausgedrückt als Nettoauswirkungen oder Nettogutschriften.</i> 	<p><i>D, Credits and loads outside the product system boundary, information module</i></p> <p><i>For the calculation processes and examples, we refer you to Annexes 3 and 4 of the TBE document, which are integrated into the Austrian PKR at the relevant points for Module D.</i></p>
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3. LCA: Calculation rules

3.1 Declared unit/ Functional unit

The declared resp. functional unit, the mass reference and the conversion factor to 1 kg must be declared in a table.

Specific LCA calculation rules for construction clay products:

The declared unit is 1 ton of brick material. The declared unit, the mass reference or the conversion factor to a ton must be stated in the table provided as declared. The gross densities of the declared products must be specified.

The manufacturer(s) of declared products must/must ensure that the reference to the component in an application-related unit is clear and unambiguous from the respective product data sheets, e.g. ton per square meter of wall area, ton per linear meter of a component, etc.

The manufacturer(s) of declared components made of material combinations must/must ensure that the total mass of a component in relation to the application-related unit is clear and unambiguous from the respective product data sheets and that the mass proportions of the non-brick building materials in relation to one ton of the total component are listed, e.g. reinforcing bars per ton of overall component, concrete per ton of overall component, proportion of insulation material per ton of filled bricks, etc.

Table 8: Declared/Functional unit

characterization	value	unit
Declared/Functional unit	1	t
Raw density (specific or balanced average value)		kg/m ³

The functional unit for clay products is preferably defined as: 1 tonne of a clay product with an expected average reference service life of 150 years. Other declared units are allowed (e.g. m² or m³) only if conversion factors are included in the EPD in order to make the translation towards 1 tonne in a transparent way.

Below you can find a list of possible conversion factors.

1- Conversion factors for clay pavers


Table 9: Examples of conversion factors for pavers

Clay pavers		
	Height of pavers (in mm)	Conversion factor
average (1700 kg/m ³)	100	0.170
	95	0.162
	90	0.153
	85	0.145
	80	0.136
	75	0.128
	70	0.118
	65	0.111
	60	0.102
other	height of the pavers (in m) *density of the pavers	

2- Conversion factors for clay roof tiles

The conversion factor 'tonne → m² roof or wall' depends of the type of clay pan and the inclination of the roof (*source: Belgian EPD, Belgian brick and clay roof tile sector*).

Table 10: Examples of conversion factors for clay roof tiles

	Weight / pc (kg)	Weight / m ² (kg/m ²)
	2,00	42
	2,30	46
	3,05	50,63
	2,65	49,55
	1,15	62,10 (35°) / 75,90 (25°)
	1,20	64,80
	2,3	62,10 (35°) / 66,70 (25°)

1- Conversion factors for protected clay masonry units

The conversion factor 'tonne → m² masonry' depends of the density of the product and the type of masonry (*source: Belgian EPD, Belgian brick and clay roof tile sector*).

Table 11: Examples of conversion factors for protected clay masonry units

Type of clay blocks	Format	Density (kg / m ³)	Weight / m ² (tonne/m ²)	
			traditional masonry	glued masonry
non loadbearing blocks	29 x 9 x 19	950	0,078	0,085
loadbearing blocks	29 x 14 x 19	850	0,109	0,119
loadbearing blocks	29 x 19 x 19	850	0,148	0,161
	other : L * I * h	other	quantity of bricks/m ² wall * weight of a brick = (1/ (L*h) * % bricks per m ² wall) * (density*L*I*h)	

1- Conversion factors for unprotected (exposed) clay masonry units

The conversion factor 'tonne → m² masonry' depends of the density of the unprotected clay masonry units and the type of masonry (*source: Belgian EPD, Belgian brick and clay roof tile sector*).

Table 12: Examples of conversion factors for unprotected clay masonry units

Facing Bricks (hand moulded, extruded, hand moulded with after pressure)			
Format : M50,M65,M90,WF,WDF			
Density (kg/m ³)	Weight/m ² wall (tonne/m ²)		
	traditional	thin-bed	glued
min (1040 kg/m ³)	0,075	0,085	0,095
average (1763 kg/m ³)	0,125	0,145	0,165
max (2100 kg/m ³)	0,155	0,170	0,195
other	quantity bricks/m ² wall * weight of a brick = (1/(L*h))*% bricks per m ² wall)*(density*L*I*h)		

averaging:

In this case, the average value used in the life cycle assessment and the range for the raw density must be stated.

If averages are declared for different products, the averaging must be explained in accordance with the TBE document (pages 55-57).

There are several possibilities to make an LCA at the clay product level:

- Specific product, specific site level: one specific clay product produced at one specific production site plant (example: a white unprotected masonry unit produced in one of the plants in Belgium of one Belgian producer)
- Average product, specific site level: an average clay product produced at one specific production site plant (example: an average unprotected masonry unit produced in one of the plants in Belgium of one Belgian producer)
- Specific product, company level: one specific clay product produced by a company (example: a white unprotected masonry unit produced in plants in Belgium of one Belgian producer)
- Average product, company level: an average clay product produced by a company (example: an average unprotected masonry unit produced in plants in Belgium of one Belgian producer)
- Specific product, sector level: a specific clay product produced by different companies (example: a white unprotected masonry unit produced by several companies in Belgium – sector level – members of Belgian brick and clay roof tile sector)

- **Average product, sector level:** an average clay product produced by different companies (example: an average unprotected masonry unit produced by several companies in Belgium – sector level – members of Belgian brick and clay roof tile sector)

The following calculation rules can be applied for **averaging data** when the functional unit is defined for a **sector level**:

- Option 1: Weighted averages will be used based on the production volumes of the different suppliers. These EPDs are then sector-specific or association-specific average EPDs. The averages of all inputs and outputs flows will be calculated. These averages will then be used to calculate the potential environmental impacts and the additional environmental parameters.
- Option 2: A representative supplier will be determined by surveying the main important input and output data (e.g. energy consumption, SO_x emissions) of the respective clay products manufacturers. From this survey the minimum, maximum and weighted average values (taking account of production volume) for each parameter will be calculated. The supplier that most closely matched the sector average will then be chosen as the representative supplier. The LCA will be performed using data from that representative supplier for a specific group of clay products.
- Option 3: in the situation that there is more than one representative supplier, the survey of the main input and output data will have to be collected from all relevant representative manufacturers. From this survey the minimum, maximum and weighted average values (taking account of production volume) for each parameter will be calculated. The LCA will be performed using the calculated average for a specific group of clay products.

Same calculation rules can be applied for **averaging data** at the **company level**:

- Option 1: Weighted averages will be used based on the production volumes of the different production sites. These EPDs are then company specific average EPDs. The averages of all inputs and outputs flows will be calculated. These averages will then be used to calculate the potential environmental impacts and the additional environmental parameters.
- Option 2: A representative production location will be determined by surveying the main important input and output data (e.g. energy consumption, SO_x emissions) of the respective production sites. From this survey the minimum, maximum and weighted average values (taking account of production volume) for each parameter will be calculated. The production site that most closely matched the average will then be chosen as the representative production site. The LCA will be performed using data from that representative production site for the selected clay product.
- Option 3: in the situation that there is more than one representative production site, the survey of the main input and output data will have to be collected for all relevant representative production sites. From this survey the minimum, maximum and weighted average values (taking account of production volume) for each parameter will be calculated. The LCA will be performed using the calculated average for a specific group of clay products.

The same calculation rules can be applied for **averaging data** at the **production site level**:

- Option 1: Weighted averages will be used based on the production volumes of the different products at one production site. These EPDs are then production site specific average EPDs. The averages of all inputs and outputs flows will be calculated. These averages will then be used to calculate the potential environmental impacts and the additional environmental parameters.

The use of specific, average and generic data shall be documented in the LCA report. As a rule the following distribution will be applied:

- Mining or production of the main raw materials:
 - Specific for one plant or average of different plants producing the same clay product;
- Manufacturing of the clay product:
 - Specific for one plant or average of different plants producing the same clay product;
- Packaging of the clay products:
 - Specific for one plant or average of different plants producing the same clay product;
- The mix of electricity used should be the official one in the country where main energy consuming processes take place, if site-specific data cannot be obtained. The mix of electricity (calculation procedure) shall be documented.
- Hazardous waste shall be specified according to EU Directives 91/689/EEC and 75/442/EEC:
 - Specific for one plant or average of different plants producing the same clay product.

3.2 System boundary

The type of EPD with regard to the applied system boundaries must be specified in the EPD. All building products and materials must declare modules A1-A3, modules C1-C4 and module D. The following EPD types may be specified:

- from the cradle to the factory gate with modules C1-C4 and module D (A1-A3 + C + D);

- from the cradle to the factory gate with options, modules A1-A3, C1-C4 and D (A1-A3 + C + D and additional modules. The additional modules may be one or more modules selected from A4 to B7);
- from cradle to grave and module D (A + B + C + D)

Exceptions to this rule are specified in EN 15804+A2, chapter 5.2.

Note: The specifications for the modules that must be declared no longer correspond to ÖNORM EN 16783:2017 - the specifications from EN 15804:2019+A2 apply primarily.

All declared life cycle stages (modules) are to be marked with an "X" in Table 13. Undeclared modules are to be marked with ND (= not declared).

Specific LCA calculation rules for construction clay products:

For brick products according to this PKR, only full declarations of all modules "from the cradle to the grave" are permitted according to the TBE document. The declaration of Module D is expressly recommended. The modules of the life cycle assessment according to the PCR part A: General rules for life cycle assessments and requirements for the background report Chap. 5 system boundaries are to be described briefly. It should be clear which processes are included in which modules.

Table 13: Declared life cycle stages

PRODUCT STAGE			CON- STRUCTION PROCESS STAGE		USE STAGE							END-OF-LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Construction, installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction, demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

X = included in LCA; MND = Module not declared

The modules assessed in the LCA study must be described shortly. It should be made apparent, which processes are calculated in which module and how the system boundaries to nature resp. to other product systems are set (if relevant for the declared product).

If not all modules are declared in an EPD, a clear justification must be given.

Spezielle Ökobilanzregeln für Bauprodukte aus gebranntem Ton:

A1-A3

- Bilanzierung von Sekundärrohstoffen (Ziegelsplitt, Recyclingsand)
 - Die Sammlung und Sortierung von Abfällen gehört zum Entsorgungssystem des vorherigen Produktsystems.
 - Extern bezogene Roh- oder Brennstoffe, welche den Hersteller (abgesehen von Transportkosten) nichts kosten (z.B. minderwertige Recyclingprodukte, Brennstoffe aus altem Fett) sind als wertfreie Produkte einzusetzen.

- Für alle anderen Sekundärrohstoffe, die zugekauft werden (z.B. Recycling-Sand), ist eine ökonomische Allokation durchzuführen.
- Die Aufbereitung der Abfälle mit der Intention für eine spätere Verwendung als Sekundärrohstoff im betrachteten Produktsystem ist dem betrachteten Produktsystem zuzuordnen.
- Die Aufwände des Transports vom Aufbereitungsort zur Produktionsstätte und allfällige Wiederaufbereitungsschritte sind ohne Allokation zu bilanzieren, d.h. den Sekundärrohstoffen zuzuordnen.
- Co-Produkt-Allokation:
 - Entstehen bei der Herstellung Produkte, die rezykliert werden können, ist eine ökonomische Allokation durchzuführen. (Beispiel: Tennissand)
 - Co-Produkte, welche gegebenenfalls von der Deklaration ausgenommen wurden und deren Stoffflüsse nicht aus den Produktionsdaten herausgerechnet werden können, unterliegen den Allokationsregeln der allgemeinen Richtlinie für die Ökobilanz.

A4-A5

Materialverluste

Vergleiche Tabelle 1 des TBE-Dokuments.

Wenn spezifische Daten nicht verfügbar sind, soll das folgende Default-Szenario angewandt werden. Die Default-Werte für jeglichen Materialverlust während der Einbauphase auf der Baustelle werden mit 3 % (Masse-%) für Hintermauerziegel, 3 % für Vormauerziegel und 2 % für Dachziegel festgelegt.

B1-B7

Die Stadien B1 Nutzung, B2 Instandhaltung und B3 Reparatur sind für die vorliegende Produktgruppe nicht relevant. Das Stadium B4 Ersatz ist gleichbedeutend mit dem Produktlebensende. Es fallen keine Stoff- und Energieflüsse bei der Entnahme des Produkts an. Die Stadien B5 Umbau/Erneuerung, B6 Energieeinsatz und B7 Wassereinsatz sind auf Ziegelprodukte nicht anwendbar.

Daher: Keine produktgruppenspezifischen Regeln

Siehe auch Angaben in Tabelle 3 (= Tabelle 1 TBE-Dokument)

C1-C4 und D

Bei der Bilanzierung der Entsorgungsphase muss mindestens ein Szenario die Deponierung des Produktes enthalten. Es können weitere Szenarien für das Recycling gemacht werden.

Bei der Deponierung sind nur die dem Produktabfall direkt zuordenbaren Aufwände zu berücksichtigen (z.B. keine Methangase aus anderen auf der Deponie abgelagerten Abfallstoffen). Es darf keine Gutschriften für Deponiegasnutzung zur Stromerzeugung geben, da Deponiegas der Baurestmassendeponie meistens nicht gesammelt wird.

Wiederverwendung und Recycling von Produkten aus gebranntem Ton gemäß TBE-Dokument Seite 48-49:

Re-use of clay products

Because of their long service life, clay products can be reused and recovered. They can be removed during the 'end of life stage' of the building or stored in the structure of the building in order to use them again in a new building life cycle.

For example clay roof tiles and pavers can easily be deconstructed and reused in a new building/structure entering as input of secondary material in a next life cycle. They usually do not need to be treated and only some cleaning operations could be needed to remove dirt and any other patina that could have affected the aesthetical properties of the clay products during the years.

In these cases, module C includes:

Module C:

- Deconstruction or selective demolition of the clay product
- Collection and packaging (when needed) of the clay products at the building site
- Transport to waste processing (when needed)
- Waste processing up to the end-of waste state is reached: waste processing operations might include the selective collection of the intact products, then subject to cleaning and any other process needed to restore the relevant properties of the product

And module D includes:

Module D

- Transport to a further treatment plant and/or a stockroom (if any) including packaging;
- Benefits deriving from the avoided production of a new clay product.

See for an example **Fehler! Verweisquelle konnte nicht gefunden werden.**, example 3.

Recycling of clay products

Clay products that cannot be directly reused can be crushed and then used again in road construction (sub-layer), cement clinker production, agricultural roads, embankments, tennis courts and substrate for green roofs, etc. Below a generic definition is given of module C and module D. This default scenario can be used to assess impacts, loads and benefit for e.g. masonry clay bricks and clay blocks for slabs.

Module C:

- Demolition/deconstruction of the clay product;
- Collection of the construction waste at the building site;
- Transport from the building site to a sorting plant (if any, sometimes at the building site) including any packaging when necessary;
- Sorting process (in sorting plant or at the building site);
- Transport of clay construction waste to waste processing;
- Primary crushing of clay construction waste up to the end-of waste state is reached (according the criteria of EN 15804 – paragraph 6.3.4.5)

Module D:

- Secondary crushing and size selection (if necessary, according to the new function of the material);
- Other processing steps in order to have a secondary raw material;
- Avoided extraction and processing of virgin materials used as granulates (e.g. gravel and sand).

Environmental impact and loads related to the packaging (if any) and transport of these recycled clay products are declared in the life cycle module A of the of the system where these recycled clay products will be used (e.g. a road construction site). See **Fehler! Verweisquelle konnte nicht gefunden werden.**, examples 1 and 2.

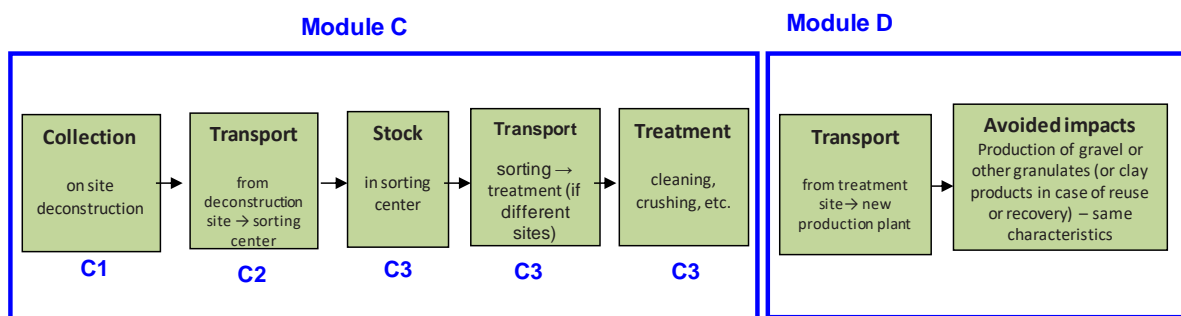


Figure 2: Illustration of the boundaries between module C and module D for recycling and reuse of clay products

Examples and explanations on module D are to be found in **Fehler! Verweisquelle konnte nicht gefunden werden.** of the TBE document.

3.3 Flow chart of processes/stages in the life cycle

A meaningful flow chart describing the manufacturing process shall give further aid to comprehension. The flow chart must be subdivided at least into the phases of life cycle declared (production, use, end-of-life). The phases can be partitioned into appropriate process stages.

3.4 Estimations and assumptions

The assumptions and assessments that are important for the interpretation of the life cycle assessment are to be listed here.

3.5 Cut-off criteria

The application of the cut-off criteria according to MS-HB Chapter 5.5.3 must be documented here.

Specific life cycle assessment rules for construction clay products:

Excerpt of cut-off criteria from the TBE document (page 53):

3.5.1.1 Application of the cut-off rules for the LCA of clay products

The cut-off rules are often dealing with input flows that are required to operate the manufacturing process. In this case the use of those input flows, (equipment, capital goods, etc.) necessary for the operation of the manufacturing process are covered by the cut-off rules if the cut-off frequency of their replacement (total or partial) is less than one year.

Examples of such input flows are:

- Conveyor belts;
- Forklifts;
- Some refractory (kiln);
- Packaging of waste.

These flows are considered negligible in the life cycle assessment, but they must be recorded qualitatively in the inventory life cycle phase.

3.5.1.2 Flows consistently omitted

Flows that can be omitted from the system boundaries are conventionally:

- Lighting, heating, cooling and cleaning of the manufacturing plant;
- Burdens related to the administrative department of the production plant;
- Transportation of employees;
- Accidental pollutions are often difficult to distinguish from emissions that occur under normal conditions (accidental pollutions are not measured and they are not reported separately) and therefore are not considered in the LCA;
- Environmental impacts caused by the personnel of the production plants are not included in the LCA, e.g. waste from the cafeteria and sanitary installations or accidental pollution caused by human mistakes, or environmental effects caused by commuter traffic;
- Manufacturing and heavy maintenance tool production and transport systems (machines, trucks, etc.);
- Equipment and maintenance in a production plant;
- Packaging of waste.

However, any maintenance performed on an annual base or above must be included in the system boundaries. What is included and excluded from the system needs to be clearly specified.

3.5.1.3 Pigments, colorants, glazes, englobes and other additives

The pigments colorants, glazes, englobes and other additives used during manufacture of the clay products do not all have accurate inventory data. This is a problem because whatever the solution, the result is questionable. As an example, one can find some best approximations for a specific pigment (e.g. close formulation for Barium Sulphate in Ecoinvent can be Barium carbonate) but this does not necessarily described the environmental burdens in an industrial reality.

The pigments, colorants, glazes, englobes and other additives will be integrated in the LCA by modelling them by selecting the best available data for the life cycle inventory of the production of the pigments (specific or generic data).

3.6 Data sources

The quality of the collected data must be described.

3.7 Data quality

The sources of the background data sets must be declared. If necessary, additional information on the quality of the used data sets shall be made (estimations). The issuing year of the used data material must be indicated.

3.8 Reporting period

The period under review must be documented (in case of average EPD this would be the basis of the calculated average).

3.9 Allocation

The allocations of relevance for calculation (appropriation of expenses across various products) must be indicated, at least:

- System boundary settings/allocation in the use of recycled and/or secondary raw materials
- Allocation concerning co-products
- Allocation of energy, auxiliary and operating materials used for individual products in a factory
- Loads and credits from recycling or energy recovery of packaging materials and production waste
- Loads and credits from recycling or energy recovery from the end of life of the product

whereby reference must be made to the modules in which the allocations are performed.

Detailed regulations concerning calculation of secondary materials and allocation MS-HB chapter “LCA rules” apply in all studies.

3.10 Comparability

With reference to comparability of EPD data the following facts must be mentioned:

Comparison or benchmarking of EPD data is only possible, if all compared data sets are calculating following EN 15804, the same programme specific PCR-rules or other additional rules. The same background data sources and software versions must be applied. Moreover, the context of the function in the building or product specific features of performance must be considered.

4. LCA: Scenarios and additional technical information

The following information is mandatory to give for all declared modules, for modules not declared it is optional. If need, additional information can be declared.

4.1 A1-A3 product stage

Following EN 15804 no scenario documentation is required for A1-A3 for the declaration and calculation of these modules lies within the responsibility of the manufacturer and must not be altered by the LCA practitioner.

Note: the masses of packaging per declared unit must be indicated, this is especially important if A5 is not declared.

4.2 A4-A5 Construction process stage

Table 9 and the units listed must be used for calculation the environmental impact of the transport phase.

Table 10 and the units listed must be used for calculation the environmental impact of the installation into the building.

Table 14: Description of the scenario „Transport to building site (A4)“

Parameters to describe the transport to the building site (A4)	Quantity per unit
Average transport distance	km
vehicle type, Commission Directive 2007/37/EC (European Emission Standard)	-
Fuel type and average consumption of vehicle	l/100 km
Maximum transport mass	tons
Capacity utilisation (including empty returns)	%
Bulk density of transported products	kg/m ³
Volume capacity utilisation factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaged products)	-

^{x)} The table must be filled with reference to the information available from the datasets used (i.e. in case of transport by ship). The datasets used must be noted in a footnote.

Specific life cycle assessment rules for construction clay products:

The average values according to Table 15 are to be used for the transport distances.

Table 15: Average transport distances for brick products in Austria

brick product	Distance [km]
Roof tiles including accessories (various shaped tiles)	150
Protected bricks including shaped bricks (solid bricks, perforated bricks)	50
Unprotected bricks including shaped bricks (facing bricks)	250
Insulation-filled bricks	250
Fired clay facade panels	250
Pavers including molded bricks	250
Ceiling tiles and hanging tiles for brick ceilings	250
chimney brick	250
Brick shells for overlays	250
precast bricks	250

Appendix 2 of the TBE document can be used to calculate the environmental impact of transport:

CALCULATION OF THE ENVIRONMENTAL IMPACTS DUE TO TRANSPORTATION

1. Calculation of fuel consumption depending on load of truck

Environmental impacts due to transportation steps in life cycle analysis are related to different transport components: vehicle operation (comprising vehicle travel and pre-combustion), infrastructure processes such as vehicle maintenance, manufacturing and disposal, as well as transport infrastructure construction, operation and disposal. Data on the different components of transportation with a certain truck are available in for instance the Ecoinvent database (Spielmann et al., 2007). The available data however are valid for an average load. When the truck load differs substantially from the average, one cannot rely on the available Ecoinvent data for the calculations of emissions due to vehicle operations. For the other components of transportation, differences will be very small and it is possible to use the Ecoinvent data records as such.

For the modeling of the operations factor in transportation, it is suggested to use an approach based on the real fuel consumption of a truck. The fuel consumption of the truck depends on the truck type, the loading weight of the truck, the speed and the slope of the roads.

For the calculations of fuel consumption the Copert 4 calculations (European Environmental Agency, 2009). With the Copert formulas it is possible to calculate the fuel consumption dependent on the speed of a certain truck and this for a certain truck, loading factor and slope.

For clay construction products the slope of the used roads is assumed to be 0%. Data on average travelling speed can be taken from the Belgian Federal Government Service Mobility and Transport (2011). It is assumed that the average travelling speed of a truck on highways is 87 km/h, on National roads 56 km/h and on local roads 28 km/h. Also for the use of the different roads, it is assumed that trucks travel 73% of the time on highways, 21% on National roads and 6% on local roads (Belgian Federal Government Service Mobility and Transport, 2011).

Example

For the calculation of fuel consumption, a 28-34 ton EURO 4 truck can be used. It is assumed that the net weight of the truck is around 10 tons. For this type of truck the fuel consumption can be calculated with the following Copert formulas (European Environmental Agency, 2009).

Table 5: Calculation of fuel consumption depending on load of truck

Truck type	Slope %	Load %	Formula (y: g/km; x: km/h)
TT/AT >28-34t Euro-4	0	100%	$y = ((179,2565 + (481,8641 * \exp(((-1) * 0,029611) * x))) + (7154,7085 * \exp(((-1) * 0,789964) * x))))$
TT/AT >28-34t Euro-4	0	50%	$y = ((177,839 + (447,112 * \exp(((-1) * 0,04132) * x))) + (10387,601 * \exp(((-1) * 0,7811) * x))))$
TT/AT >28-34t Euro-4	0	0%	$y = ((153,9574 + (459,9379 * \exp(((-1) * 0,057506) * x))) + (2992,8809 * \exp(((-1) * 0,570798) * x))))$

By using the statistics of the Belgian Federal Government Service Mobility and Transport (2011) on travelling speed and road use, it is possible to construct the following graph.

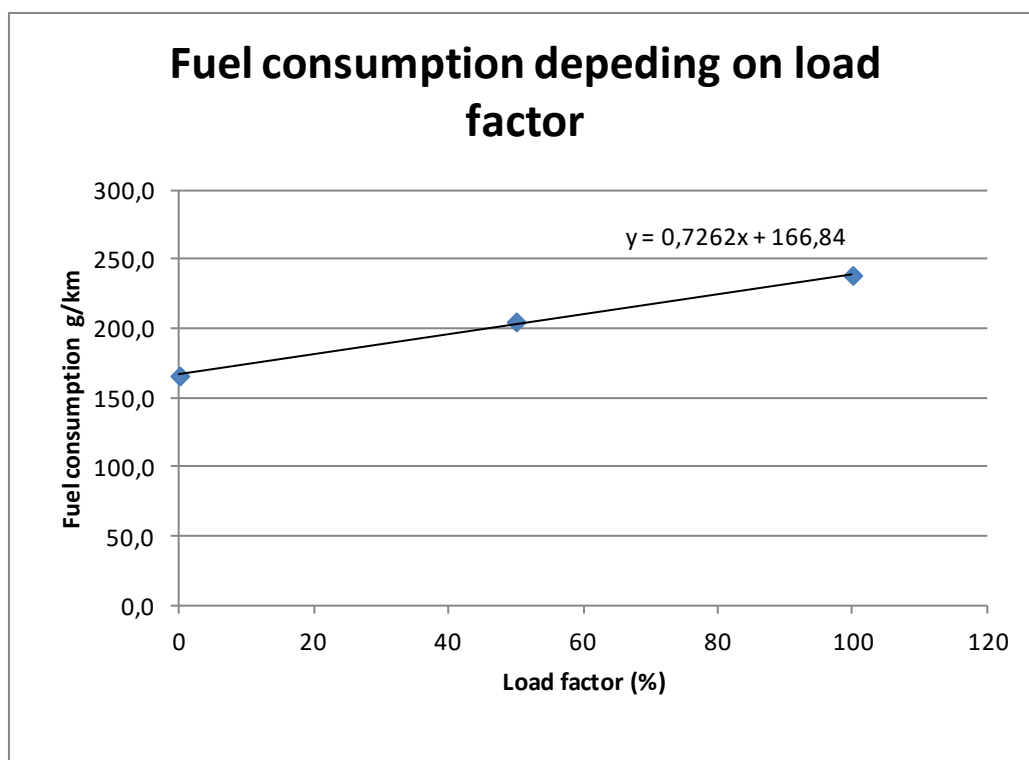


Figure 3: Fuel consumption depending on load factor

With the equation $y = 0,7262x + 166,84$ it is possible to calculate the approximate fuel consumption for every load factor.

In order to link the emissions due to operations based on real fuel consumption to emissions due to other transport factors (maintenance, manufacturing, transport infrastructure construction ...) the fuel consumption available in Ecoinvent for a truck with average load was modified to represent the fuel consumption of the actual situation.

2. Calculation of trucks necessary to transport the functional unit

A 28-34t truck is assumed to have a tarra of 28 ton. The truck weight is 10 ton (Spielman et al., 2007 (pg92)). The max weight that can be loaded on the truck is 18 ton. This allows us to calculate the trucks necessary to transport a certain weight.

The table below gives an overview of the national average transportation distances to the construction site.

Table 16: Description of the scenario „Installation of the product in the building (A5)“ as per table 8 in ÖNORM EN 15804

Parameters to describe the installation of the product in the building (A5)	Quantity per unit
Ancillary materials for installation (specified by material);	Meaningful unit
Water use	m ³
Other resource use	kg
Electricity demand	kWh or MJ
Other energy carrier(s):	kWh or other unit (e.g. litres)
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	kg
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route)	kg
Direct emissions to ambient air, soil and water	kg

4.3 B1-B7 use stage

Reference Service life: [a]

The parameters and the units listed in the following tables must be used for calculation the environmental impact of the use stage (B2-B7). The tables can be excluded if no input or output happens. In this case a note of explanation would be sufficient: "In module BX-BY no material resp. mass flows occur, input +/- output = 0

Table 17: Description of the scenario „maintenance (B2)“ based on table 9 in EN 15804

Parameters maintenance (B2)	value	unit
Maintenance process		Description or source where description can be found
Maintenance cycle		Number per RSL or year ^a
Ancillary materials for maintenance, e.g. cleaning agent, specify materials		kg/cycle
Waste material resulting from maintenance (specify materials)		kg
Net fresh water consumption during maintenance		m ³
Energy input during maintenance, e.g. vacuum cleaning, energy carrier type, e.g. electricity, and amount, if applicable and relevant		kWh

Table 18: Description of the scenario „repair (B3)“

Parameters repair (B3)	value	unit
Repair process		Description or source where description can be found
Inspection process		Description or source where description can be found
Repair cycle		Number per RSL or year
Ancillary materials, e.g. lubricant, specify materials		Kg or kg/cycle
Waste material resulting from repair, (specify materials)		kg
Net fresh water consumption during repair		m ³
Energy input during repair, e.g. crane activity, energy carrier type, e.g. electricity, and amount		kWh

Table 19: Description of scenario „replacement (B4)“

Parameters replacement (B4)	value	unit
Replacement cycle		Number per RSL or year
Energy input during replacement e.g. crane activity, energy carrier type, e.g. electricity and amount if applicable and relevant		kWh
Exchange of worn parts during the product's life cycle, e.g. zinc galvanised steel sheet, specify materials		kg

Table 20: Description of scenario „refurbishment (B5)“

Parameters refurbishment (B5)	value	unit
Refurbishment process		Description or source where description can be found
Refurbishment cycle		Number per RSL or year
Energy input during refurbishment e.g. crane activity, energy carrier type, e.g. electricity, and amount if applicable and relevant		kWh
Material input for refurbishment, e.g. bricks, including ancillary materials for the refurbishment process e.g. lubricant, (specify materials)		kg or kg / cycle
Waste material resulting from refurbishment (specify materials)		kg
Further assumptions for scenario development, e.g. frequency and time period of use, number of occupants		Units as appropriate

Table 21: Description of scenarios „energy (B6)“ resp. „Water (B7)“

Parameters energy (B6) and water (B7)	value	unit
Ancillary materials, e.g. lubricant, specify materials		Kg or kg/cycle
Net fresh water consumption		m ³
Type of energy carrier, e.g. electricity, natural gas, district heating		kWh or m ³
Power output of equipment		kW
Characteristic performance, e.g. energy efficiency, emissions, variation of performance with capacity utilisation etc.		units as appropriate
Further assumptions for scenario development, e.g. frequency and period of use, number of occupants		units as appropriate

Specific LCA calculation rules for construction clay products:

In the use phase (B1), there are no material and energy flows relevant to the life cycle assessment for construction clay products (i.e. the results for B1 are to be set at "zero").

No maintenance, repair, replacement or conversion processes take place for construction clay products during use, which is why modules B2 to B5 cause no environmental impact (i.e. the results for B2 are to be set as "zero"). Modules B6 and B7 are not relevant for construction clay products, which means that there is no environmental impact either (B6 and B7 are to be declared as "0").

4.4 C1-C4 End-of-Life stage

Short description of processes concerning disposal and scenarios going with that (i.e. for transport).

Specific LCA calculation rules for construction clay products:

In principle, dismantled building products made of fired clay are fed into a recycling process.

Table 22: Description of the scenario „Disposal of the product (C1 to C4)“ according to table 12 in EN 15804

Parameters for End-of-Life stage (C1-C4)	value	Quantity per m ³ insulation material
Collection process specified by type		kg collected separately
		kg collected with mixed construction waste
Recovery system specified by type		kg for re-use
		kg for recycling
		kg for energy recovery
Disposal specified by type		kg product or material for final deposition
Assumptions for scenario development, e.g. transportation		Appropriate units

4.5 D Potential of reuse and recycling

Short description of assumptions for reuse-, recover- and recycling processes.

Specific LCA calculation rules for construction clay products:

The substitution of primary raw materials, taking into account the secondary material share of the material removed in C1, is shown in Module D (net flow), provided such a scenario is calculated.

Table 23: Description of the scenario „re-use, recovery and recycling potential (module D)“

(Substituted primary materials resp. technologies must be declared in a separate footnote (including technical information).)

Parameters for module D	value	unit
Materials for reuse, recovery or recycling from A4-A5		%
Energy recovery or secondary fuels from A4-A5		MJ/t resp. kg/t
Materials for reuse, recovery or recycling from B2-B5		%
Energy recovery or secondary fuels from B2-B5		MJ/t resp. kg/t
Materials for reuse, recovery or recycling from C1-C4		%
Energy recovery or secondary fuels from C1-C4		MJ/t resp. kg/t

5. LCA: results

The declaration of environmental indicators must be listed in the following tables with reference only to the declared life cycle stages. Indicator values should be declared with three valid digits (eventually exponential form (e.g. 1.23E-5 = 0.0000123). A uniform format should be used for all values of one indicator. It is preferred that the definitions of the environmental indicators are spelled out completely to ensure the best possible readability. If space is needed in case of too many columns the defined abbreviations are accepted.

Table 24: Parameters to describe the environmental impact of mineral insulating products per declared/functional unit

Parameter	unit	A1-A3	A4	A5	B1	B2	B5	B6	B7	C1	C2	C3	C4	D
GWP total	kg CO ₂ eq.													
GWP fossil fuels	kg CO ₂ eq.													
GWP biogenic	kg CO ₂ eq.													
GWP luluc	kg CO ₂ eq.													
ODP	kg CFC-11 eq.													
AP	mol H ⁺ eq.													
EP freshwater	kg PO ₄ ³⁻ eq.													
EP marine	kg N eq.													
EP terrestrial	mol N eq.													
POCP	kg NMVOC eq.													
ADPE	kg Sb eq.													
ADPF	MJ H _u													
WDP	m3 Welt eq. entz.													
		GWP = Global warming potential; luluc = land use and land use change; ODP = Depletion potential of the stratospheric ozone layer;												

Legende	AP = Acidification potential, Accumulated Exceedance; EP = Eutrophierungspotenzial; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources WDP = Water (user) deprivation potential, deprivation-weighted water consumption
---------	--

Table 25: Additional environmental indicators

Parameter	Unit	A1-A3	A4	A5	B1	B2	B5	B6	B7	C1	C2	C3	C4	D
PM	disease incidence													
IRP	kBq U235 eq.													
ETP-fw	CTUe													
HTP-c	CTUh													
HTP-nc	CTUh													
SQP	dimension-less													
Legende	PM = Potential incidence of disease due to Particulate Matter emissions; IRP = Potential Human exposure efficiency relative to U235; ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c = Potential Comparative Toxic Unit for humans – cancer effect; HTP-nc = Potential Comparative Toxic Unit for humans – non-cancer effect; SQP = Potential soil quality index													

Table 26: Parameters to describe the use of resources of mineral insulating products per declared/functional unit

Parameter	unit	A1-A3	A4	A5	B1	B2	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ, net calorific value													
PERM	MJ, net calorific value													
PERT	MJ, net calorific value													
PENRE	MJ, net calorific value													
PENRM	MJ, net calorific value													
PENRT	MJ, net calorific value													
SM	kg													
RSF	MJ, net calorific value													
NRSF	MJ, net calorific value													
FW	m ³													
Legend	<p>PERE = Renewable primary energy as energy carrier; PERM = Renewable primary energy resources as material utilization; PERT = Total use of renewable primary energy resources; PENRE = Non-renewable primary energy as energy carrier; PENRM = Non-renewable primary energy as material utilization; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of fresh water</p>													

contains restrictions that must be declared according to the following classification in the project report and in the EPD with regard to the declaration of relevant core and additional environmental impact indicators.

Table 27 contains restrictions that must be declared according to the following classification in the project report and in the EPD with regard to the declaration of relevant core and additional environmental impact indicators.

Table 27: Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD-classification	Indicator	Disclaimer
ILCD-Type 1	GWP Global Warming Potential	none
	ODP Ozone Depletion Potential	none
	PM Particulate Matter	none
ILCD-Type 2	Acidification potential, Accumulated Exceedance (AP)	none
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	none
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	none
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	none
	Formation potential of tropospheric ozone (POCP)	none
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD-Type 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2
Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.		
Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.		

Table 28: Parameters describing LCA-output flows and waste categories of mineral insulating products per declared/functional unit

Parameter	unit	A1-A3	A4	A5	B1	B2	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg													
NHWD	kg													
RWD	kg													
CRU	kg													
MFR	kg													
MER	kg													
EEE	MJ													
EET	MJ													
Legend	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electric energy; EET = Exported thermal energy													

Table 29: Information for description biogenic carbon content at factory gate

Biogenic carbon content	unit
Biogenic carbon content in the product	kg C
Biogenic carbon content of packing	kg C
Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO ₂	

If the mass of biogenic carbon containing materials in the product is less than 5 % of the mass of the product, the declaration of biogenic carbon content may be omitted.

If the mass of biogenic carbon containing materials in the packaging is less than 5 % of the total mass of the packaging, the declaration of the biogenic carbon content of the packaging may be omitted.

6. LCA: Interpretation

For better understanding of the LCA, the aggregated indicators of the inventory analysis as well as those of the impact assessment (LCIA) from chapter 5 must be interpreted in a dominance analysis. The interpretation must describe a range resp. variance of LCIA results, if the EPD is valid for more than one product.

It is recommended to illustrate the results with graphic elements (i.e. the dominance analysis showing distribution of environmental impacts over several modules...)

When declaring average products, the range of possible results for the individual products for the main impact categories that are relevant to the materials used must be specified.

As for module D, the interpretation must declare, that the benefits and loads lie beyond the system boundary. Any graphic elements showing result interpretation of the life cycle must be created in a way, that modules A1-C4 and module D are displayed separate picture elements. Alternatively, the results can be interpreted without graphic elements.

Extension of an EPD:

It is mandatory to declare in a separate block in the project report:

Reasons for deviations of results of single indicators of more than 15% compared to the results before. This serves as an information for verifiers and enhances legal compliance. Users of the data can be informed of such facts.

Claims that can be published (i.e. same framework conditions, different electricity mix) can be declared in the EPD, if desired.

7. Literature

Relevant standards and sources for the preparation of the EPD resp. for the definition of the product must be listed here. The full documentation of references is to be done as follows:

Author, First name. and Author, First name. (year). Title of article. subtitle. location: publishing company.
 Author, First name. (year). Title of article. In: Surname, First name. and Surname, First name. (Publishing company): Name of paper. Bd. 2 or year number, 207-210.
 Organisation (Year): Full name of standard or rule. Date of Issue. Location. Legal institution.

Always to be quoted:

ÖNORM EN ISO 14040 Environmental management - Life cycle assessment -- Principles and framework

ÖNORM EN ISO 14044 Environmental management - Life cycle assessment -- Requirements and guidelines

ÖNORM EN ISO 14025 Environmental labels and declarations -Type III environmental declarations -- Principles and procedures

ÖNORM EN 15804 Sustainability of construction works - environmental product declarations. Core rules for the product category of construction products

Management system handbook including applicable documents from Bau EPD GmbH

Other underlying documents:

VITO – Flemish Institute for Technological Research NV (2014) – Study under the authority of TBE (Tiles and Bricks Europe) “Product Category Rules for Environmental Product Declarations for Construction Clay Products” Version 5 – Date of publication: 21.01.2014, Belgium, www.vito.be

8. Directory and Glossary

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Es konnten keine Einträge für ein Abbildungsverzeichnis gefunden werden.

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8.3 Abbreviations

8.3.1 Abbreviations as per ÖNORM EN 15804

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
EPBD	Energy Performance of Buildings Directive
GWP	global warming potential
ODP	depletion potential of the stratospheric ozone layer
AP	acidification potential of soil and water
EP	eutrophication potential
POCP	formation potential of tropospheric ozone
ADP	abiotic depletion potential

8.3.2 Abbreviations as per PCR on hand

CE-mark	french: Communauté Européenne or Conformité Européenne = EC certificate of conformity
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals



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Name of Institution (if rel.)
Address
Postcode, Location

Mail Person creator
Tel
Fax
Mail
Web

Logo

Owner of the declaration

Name of creator in person
Name of Institution (if rel.)
Address
Postcode, Location

Tel
Fax
Mail
Web