



BSI Standards Publication

Product category rules for ceramic tiles

National foreword

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

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English Version

Product category rules for ceramic tiles

Règles de définition des catégories de produits pour les
carreaux céramiques

Produktkategorieregeln für keramische Fliesen und
Platten

This European Standard was approved by CEN on 23 December 2018.

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European foreword

This document (EN 17160:2019) has been prepared by Technical Committee CEN/TC 67 “Ceramic tiles”, the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2019, and conflicting national standards shall be withdrawn at the latest by August 2019.

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

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Introduction

The European Standard EN 15804:2012+A1:2013 provides the core product category rules for all construction products and services. It provides a structure to ensure that all Environmental Product Declarations (EPD) of construction products, construction services and construction processes are derived and presented in a harmonized way.

These Product Category Rules (PCR) provide rules for the creation of EPD for ceramic tiles. It complements the core product category rules for all construction products and services as established in EN 15804:2012+A1:2013.

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

The standardization process has taken place in accordance with EN ISO 14025:2010. All common issues are covered horizontally for all product types in order to minimize vertical (branch specific) deviations.

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

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

EN 15804:2012+A1:2013 deals with a limited number of quantifiable predetermined parameters. Future revisions of EN 15804:2012+A1:2013 may lead to the incorporation of additional predetermined parameters.

EN 15804:2012+A1:2013 provides the means of developing a Type III environmental declaration of construction products in the context of the suite of standards that are intended to assess the sustainability of construction works.

This suite of standards includes:

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

1 Scope

This document defines Product Category Rules (PCR) providing guidelines and rules for developing a type III environmental declaration (EPD) for ceramic tiles produced by extrusion and dry-pressing techniques, mainly used for internal and/or external floorings and walls coverings and façade cladding.

These PCR specify the calculation rules in accordance with EN 15804:2012+A1:2013 for the Life Cycle Assessment (LCA) of ceramic tiles for developing an EPD, as well as the requirements on the background of the LCA.

These PCR:

- define the parameters to be declared and the way in which they are collated and reported;
- describe which stages of ceramic tiles's life cycle are considered in the EPD and which processes are to be included in the life cycle stages;
- defines rule for the development of scenarios;
- include the rules for calculating the Life Cycle Inventory and the Life Cycle Impact Assessment underlying the EPD, including the specification of the data quality to be applied;
- include the rules for reporting predetermined, environmental and health information, that is not covered by LCA for a ceramic tile, construction process and construction service where necessary;
- define the conditions under which ceramic tiles can be compared based on the information provided by EPD.

The EPD developed using these PCR will contain data from the product stages (A1 to A3). Optionally, the manufacturer can include all modules of the product's life cycle stages (construction process, use, and end of life) (A4 to C4), using the scenarios described in 7.3 when primary data are not available. The results of these stages shall be shown individually (without being added together).

Therefore, these PCR cover:

- EPD cradle-to-gate (only the product stage is considered);
- EPD cradle-to-grave (the whole life cycle of ceramic tiles is considered). In these type of EPD module D may be included.

After verification an EPD is valid for a 5 year period from the date of issue, after which it shall be reviewed and verified.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 14411:2016, *Ceramic tiles - Definition, classification, characteristics, assessment and verification of constancy of performance and marking*

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

CEN/TR 15941, *Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data*

EN 15942, *Sustainability of construction works - Environmental product declarations - Communication format business-to-business*

EN ISO 14025:2010, *Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006)*

EN ISO 14044:2006, *Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006)*

ISO 15686-1, *Buildings and constructed assets — Service life planning — Part 1: General principles and framework*

ISO 15686-2, *Buildings and constructed assets — Service life planning — Part 2: Service life prediction procedures*

ISO 15686-7, *Buildings and constructed assets — Service life planning — Part 7: Performance evaluation for feedback of service life data from practice*

ISO 15686-8:2008, *Buildings and constructed assets — Service-life planning — Part 8: Reference service life and service-life estimation*

ISO/TS 15686-9, *Buildings and constructed assets — Service-life planning — Part 9: Guidance on assessment of service-life data*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

additional technical information

information that forms part of the EPD by providing a basis for the development of scenarios

[SOURCE: EN 15804:2012+A1:2013]

3.2

allocation

partitioning the input or output flows of a process or a product system between the product system under study and one or more other product systems

[SOURCE: EN ISO 14040:2006]

3.3

ancillary material

input material or product that is used by the unit process producing the product, but which does not constitute part of the product

Note 1 to entry: Example of ancillary material oil used in the press, batteries, lime used into purification systems.

[SOURCE: EN ISO 14040:2006]

3.4

average data

data representative of a product, product group or construction service, provided by more than one supplier

Note 1 to entry: The product group or construction service can contain similar products or construction services.

[SOURCE: EN 15804:2012+A1:2013]

3.5

by-product

production material that is not waste and process characteristics that make it ready for further use in the market place without any further processing

Note 1 to entry: Example of by-product fired and unfired production solid discharge materials.

[SOURCE: ISO 14021:2016]

3.6**ceramic tile**

tile made from clays and/or other inorganic raw materials

Note 1 to entry: Tiles are usually shaped by extruding (Method A) or dry-pressing (Method B) at room temperature followed by drying and firing at temperatures sufficient to develop the required properties, but can be formed by other processes (these are not covered by EN 14411). Tiles can be glazed (GL) or unglazed (UGL).

[SOURCE: EN 14411:2016]

3.7**comparative assertion**

environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function

[SOURCE: EN ISO 14044:2006]

3.8**construction element**

part of a construction containing a defined combination of products

[SOURCE: EN 15804:2012+A1:2013]

3.9**construction product**

item manufactured or processed for incorporation in construction works

Note 1 to entry: Construction products are items supplied by a single responsible body.

Note 2 to entry: Adapted from the definition in ISO 6707-1:2004 according to the recommendation of ISO/TC 59/AHG Terminology.

[SOURCE: EN 15643-1:2010, 3.11]

3.10**construction service**

activity that supports the construction process or subsequent maintenance

[SOURCE: EN 15804:2012+A1:2013]

3.11**co-product**

any of two or more marketable materials, products or fuels from the same unit process, but which is not the object of the assessment

Note 1 to entry: Co-product, by-product and product have the same status and are used for identification of several distinguished flows of products from the same unit process. From co-product, by-product and product, waste is the only output to be distinguished as a non-product.

Note 2 to entry: Example of by-product spray dry powder sold to a third company.

[SOURCE: EN 15804:2012+A1:2013]

3.12

declared unit

quantity of a construction product for use as a reference unit in an EPD for an environmental declaration based on one or more information modules

EXAMPLE Surface (1 m²).

[SOURCE: EN 15804:2012+A1:2013]

3.13

environmental aspect

element of an organisation's activities or products or services that interacts or can interact with the environment

[SOURCE: EN ISO 14001:2015]

3.14

environmental impact

change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects

[SOURCE: EN ISO 14001:2015]

3.15

environmental performance

performance related to environmental impacts and environmental aspects

[SOURCE: ISO 15392:2008, 3.12, modified – Note 1 to entry deleted]

3.16

functional equivalent

quantified functional requirements and/or technical requirements for a building or an assembled system (part of works) for use as a basis for comparison

Note 1 to entry: Adapted from the definition in ISO 21931-1:2010.

3.17

functional unit

quantified performance of a product system for use as a reference unit

[SOURCE: EN ISO 14040:2006]

3.18

impact category indicator

quantifiable representation of an impact category

[SOURCE: EN ISO 14040:2006]

3.19

information module

compilation of data to be used as a basis for a Type III environmental declaration covering a unit process or a combination of unit processes that are part of the life cycle of a product

[SOURCE: EN ISO 14025:2010]

3.20

life cycle

consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to disposal

[SOURCE: EN ISO 14040:2006]

3.21

life cycle assessment

LCA

compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle

[SOURCE: EN ISO 14044:2006]

3.22

life cycle inventory analysis

LCI

phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle

[SOURCE: EN ISO 14040:2006]

3.23

life cycle impact assessment

LCIA

phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product

[SOURCE: EN ISO 14040:2006]

3.24

mosaic

any piece that can fit into a square the side of which is less than 7 cm

[SOURCE: EN 14411:2016]

3.25

non-renewable energy

energy from sources which are not defined as *renewable energy* sources

[SOURCE: EN 15804:2012+A1:2013]

3.26

non-renewable resource

resource that exists in a finite amount that cannot be replenished on a human time scale

[SOURCE: ISO 21930:2017]

3.27

performance

expression relating to the magnitude of a particular aspect of the object of consideration relative to specified requirements, objectives or targets

3.28

product category rules

PCR

set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories

[SOURCE: EN ISO 14025:2010]

3.29

product system

collection of unit processes with elementary and product flows, performing one or more defined functions, and which models the life cycle of a product

[SOURCE: EN ISO 14040:2006]

3.30

programme operator

body or bodies that conduct a Type III environmental declaration programme

Note 1 to entry: A program operator can be a company or a group of companies, industrial sector or trade association, public authorities or agencies, or an independent scientific body or other organization.

[SOURCE: EN 15804:2012+A1:2013]

3.31

reference service life

RSL

service life of a construction product which is known to be expected under a particular set, i.e., a reference set, of in-use conditions and which may form the basis of estimating the service life under other in-use conditions

[SOURCE: ISO 21930:2017]

3.32**reference service life data****RSL data**

information that includes the reference service life and any qualitative or quantitative data describing the validity of the reference service life

EXAMPLE Typical data describing the validity of the RSL include the description of the component for which it applies, the reference in-use conditions under which it applies, and its quality.

[SOURCE: ISO 15686-8:2008]

3.33**renewable energy**

energy from renewable non-fossil sources

EXAMPLE Wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.

[SOURCE: Directive 2009/28/EC, Art. 2, (a), modified]

3.34**renewable resource**

resource that is grown, naturally replenished or naturally cleansed, on a human time scale

Note 1 to entry: A renewable resource is capable of being exhausted, but may last indefinitely with proper stewardship. Examples include: trees in forests, grasses in grassland, fertile soil.

[SOURCE: ISO 21930:2017]

3.35**scenario**

collection of assumptions and information concerning an expected sequence of possible future events

[SOURCE: EN 15804:2012+A1:2013]

3.36**secondary material**

material recovered from previous use or from waste which substitutes primary materials

Note 1 to entry: Secondary material is measured at the point where the secondary material enters the system from another system.

Note 2 to entry: Materials recovered from previous use or from waste from one product system and used as an input in another product system are secondary materials.

Note 3 to entry: Examples for secondary materials: recovered glass and sludge coming from external plant.

[SOURCE: EN 15804:2012+A1:2013]

3.37**specific data**

data representative of a product, product group or construction service, provided by one supplier

[SOURCE: EN 15804:2012+A1:2013]

3.38

system boundary

set of criteria specifying which unit processes are part of a product system

[SOURCE: EN ISO 14044:2006]

3.39

third party

person or body that is recognized as being independent of the parties involved, as concerns the issues in question

Note 1 to entry: "Parties involved" are usually supplier "first party" and purchaser "second party" interests.

[SOURCE: EN ISO 14024:2000]

3.40

type III environmental declaration

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

Note 1 to entry: The calculation of predetermined parameters is based on the ISO 14040 series of standards, which is made up of ISO 14040, and ISO 14044. The selection of the predetermined parameters is based on ISO 21930 adapted from ISO 14025.

[SOURCE: EN 15804:2012+A1:2013]

3.41

upstream process

process that precedes a given life cycle stage

[SOURCE: EN 15804:2012+A1:2013, modified]

3.42

downstream process

process that follows a given life cycle stage

[SOURCE: EN 15804:2012+A1:2013, modified]

3.43

waste

substance or object which the holder discards or intends or is required to discard

[SOURCE: Directive 2008/98/EC, Art. 3, 1.]

3.44

unit process

smallest element considered in the life cycle inventory analysis for which input and output data are quantified

[SOURCE: EN ISO 14040:2006]

4 Abbreviations

For the purposes of this document, the following abbreviations apply.

BREF	best available techniques reference document
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
EOL	end of life
ESL	estimated service life
ELCD	European life cycle database
EPBD	energy performance of buildings directive

5 General aspects

5.1 Objective of ceramic tiles PCR

The objective of the PCR for ceramic tiles is to ensure:

- the provision of verifiable and consistent data for an EPD, based on the LCA;
- the provision of verifiable and consistent ceramic tiles related technical data or scenarios for the assessment of the environmental performance of buildings;
- the provision of verifiable and consistent ceramic tiles related technical data or scenarios potentially related to the health of users for the assessment of the performance of buildings;
- that comparisons between construction products are carried out in the context of their application in the building;
- the communication of the environmental information of construction products from business to business;
- the basis, subject to additional requirements, for the communication of the environmental information of ceramic tiles to consumers.

Declarations based on this standard are not comparative assertions.

5.2 Types of EPD with respect to life cycle stages covered

The EPD shall at least include the product stage (A1 to A3) of ceramic tiles (see Figure 1). If the entire life cycle of the product is considered, this shall be subdivided into the following stages:

- Product: corresponds to the manufacture of the ceramic tiles, including all the upstream processes of the product stage (raw materials supply and/or recycled materials, raw materials' transport, energy supply, etc.). It comprises modules A1, A2, and A3 of EN 15804:2012+A1:2013;

- Construction process: transport to the building site and installation in the building work. This comprises modules A4 and A5 of EN 15804:2012+A1:2013;
- Use: corresponds to use of ceramic tiles, maintenance, repair, replacement, and refurbishment, including transport (modules B1, B2, B3, B4 and B5, respectively, of EN 15804:2012+A1:2013), as well as operational energy use and operational water use in the building during product use (modules B6 and B7, respectively, of EN 15804:2012+A1:2013);
- End of life: This stage comprises all the actions and processes relating to de-construction, demolition, transport, reuse and recycling, and disposal. It corresponds to modules C1, C2, C3 and C4 of EN 15804:2012+A1:2013.

In the cradle to grave EPD, the information module D may be included.

5.3 Comparability of EPD for construction product

In principle the comparison of products on the basis of their EPD is defined by the contribution they make to the environmental performance of the building. Consequently comparison of the environmental performance of construction products using the EPD information shall be based on the product's use in and its impacts on the building, and shall consider the complete life cycle (all information modules). If the EPD is based on a cradle to gate approach, the comparison of construction products and construction services is only possible if the following requirements are ensured:

- the same functional requirements as defined by legislation or in the client's brief are met; and
- the environmental performance and technical performance of any assembled systems, components, or products excluded are the same; and
- the amounts of any material excluded are the same; and
- excluded processes or life cycle stages are the same; and
- the influence of the product systems on the operational aspects and impacts of the building are taken into account.

The information provided for such comparison shall be transparent to allow the purchaser or user to understand the limitations of comparability. A justification shall be given for any excluded aspects.

Where an EPD does not cover all life cycle stages relevant for the comparison or if the assumptions underlying the scenario of a declared information module are not applicable in the building context, then investigations will be required to determine the environmental aspects and impacts of specific scenarios for the calculation of modules beyond the cradle to gate modules. These calculations shall be based on scenarios and conditions that are appropriate for the building as the object of assessment.

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1) Inclusion for a declared scenario
2) If all scenarios are given

Figure 1 — Types of EPD with respect to life cycle stages covered and life cycle stages and modules for the building assessment.
(EN 15804:2012+A1:2013)

NOTE Cradle to gate with option EPDs are not applicable for this PCR.

5.4 Additional information

In these PCR the following two categories of information which are not derived from LCA are addressed:

- additional technical information, describing technical conditions underlying scenarios and characterizing the ceramic tiles' technical and functional performance during the optional life cycle stages "construction process, use and the end of life" for any scenario based calculations of the LCA based parameters. See 7.3;
- additional information on emissions to indoor air, soil and water during the use stage, describing release of dangerous substances into indoor air, soil and water which are not covered by LCIA. This additional information is required. See 7.4.

5.5 Ownership, responsibility and liability for the EPD

A manufacturer or a group of manufacturers are the sole owners and have liability and responsibility for an EPD.

5.6 Communication formats

The communication format of the EPD shall be in accordance with EN 15942.

6 Product Category Rules for LCA

6.1 Product category

The product category referred to in these PCR includes all ceramic tiles coverings for flooring and/or wall and façade cladding, both indoors and outdoors, including mosaics and decorative pieces.

6.2 Life cycle stages and their information modules to be included

6.2.1 General

The environmental information of an EPD covering all life cycle stages ("cradle to grave") shall be subdivided into the information module groups A1 to A3, A4-A5, B1 to B5, B6-B7, C1 to C4 and module D. Only the declaration of the product stage modules, A1 to A3, is required for compliance with these PCR.

Information modules within any of the life cycle stages are communicated depending on the types of EPD as specified in 5.2. They include impacts and aspects related to losses in the module in which the losses occur (i.e. production, transport, and waste processing and disposal of the lost waste products and materials).

6.2.2 A1-A3 Product stage, information modules

The product stage includes:

A1: raw material extraction and processing, processing of secondary material input (e.g. recycling processes, recovered glass and sludge);

A2: transport of raw materials to the manufacturer;

A3: manufacturing of ceramic tiles;

including provision of all materials, products and energy, as well as waste processing up to the end-of waste state (6.3.4.5) or disposal of final residues during the product stage.

Module A1, A2 and A3 may be declared as one aggregated module A1 to A3.

6.2.3 A4-A5 Construction process stage, information modules

The construction process stage includes:

A4: transport from the manufacturer to the building site;

A5: installation of ceramic tiles into the building;

including provision of all materials, products and energy, as well as waste processing up to the end-of-waste state or disposal of final residues during the construction process stage. These information modules also include all impacts and aspects related to any losses during this construction process stage (i.e. production, transport, and waste processing and disposal of the lost products and materials).

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

The use stage, related to the building fabric includes:

B1: use of the installed ceramic tile;

B2: maintenance;

B3: repair;

B4: replacement;

B5: refurbishment;

including provision and transport of all materials, products and related energy and water use, as well as waste processing up to the end-of-waste state or disposal of final residues during this part of the use stage. These information modules also include all impacts and aspects related to the losses during this part of the use stage (i.e. production, transport, and waste processing and disposal of the lost products and materials).

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

The use stage related to the operation of the building includes:

B6: operational energy use (e.g. operation of heating system and other building related installed services);

B7: operational water use;

These information modules include provision and transport of all materials, products, as well as energy and water provisions, waste processing up to the end-of-waste state or disposal of final residues during this part of the use stage.

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

The end-of-life stage includes:

C1: de-construction, demolition;

C2: transport to waste processing;

C3: waste processing for reuse, recovery and/or recycling;

C4: disposal;

including provision and all transport, provision of all materials, products and related energy and water use.

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

Module D includes:

D: reuse, recovery and/or recycling potentials, expressed as net impacts and benefits.

6.3 Calculation rules for the LCA

6.3.1 Functional unit

Ceramic tiles have various functions, including flooring and/or cladding of walls, terraces and façades. The functional unit considered for the LCA study of an EPD is 1 m² of ceramic tile for covering walls and floors for a period of 50 years (see EN 14411:2016, Table ZA.1.1, Note g).

6.3.2 Declared unit

The declared unit provides a reference for the normalization of the environmental data of the informative modules and shall be related to the typical functions of the products. For the EPDs that declare information up to the factory gate, the declared unit to be applied is 1 m² of ceramic tile for covering walls and floors.

6.3.3 Reference service life (RSL)

RSL information to be declared in an EPD covering the use stage shall be provided by the manufacturer. The RSL shall refer to the declared technical and functional performance of the product within a building. It shall be established in accordance with any specific rules given in European product standards and shall take into account ISO 15686-1, ISO 15686-2, ISO 15686-7 and ISO 15686-8:2008. Where European product standards provide guidance on deriving the RSL, such guidance shall have priority. Information on the product's RSL requires specification of compatible scenarios for the product stage, construction process stage and use stage. RSL is dependent on the properties of the product and reference in-use conditions. These conditions shall be declared together with a RSL and it shall be stated that the RSL applies for the reference conditions only.

The RSL shall be verifiable. Requirements and guidance on the estimation of service life are given in normative EN 15804:2012+A1:2013, Annex A.

6.3.4 System boundaries

6.3.4.1 General

The system boundaries specify the unit processes to be included in the system being studied for the development of the EPD. The product stage (A1 to A3) shall be included. All the relevant processes need to be included in the analysed stages; in order to identify these processes, the rules for the exclusion of inputs and outputs specified in 6.3.6 shall be applied. Figure 1 shows the system boundaries.

Figure 2 illustrates a detailed example of a cradle-to-gate ceramic tile process flow diagram.

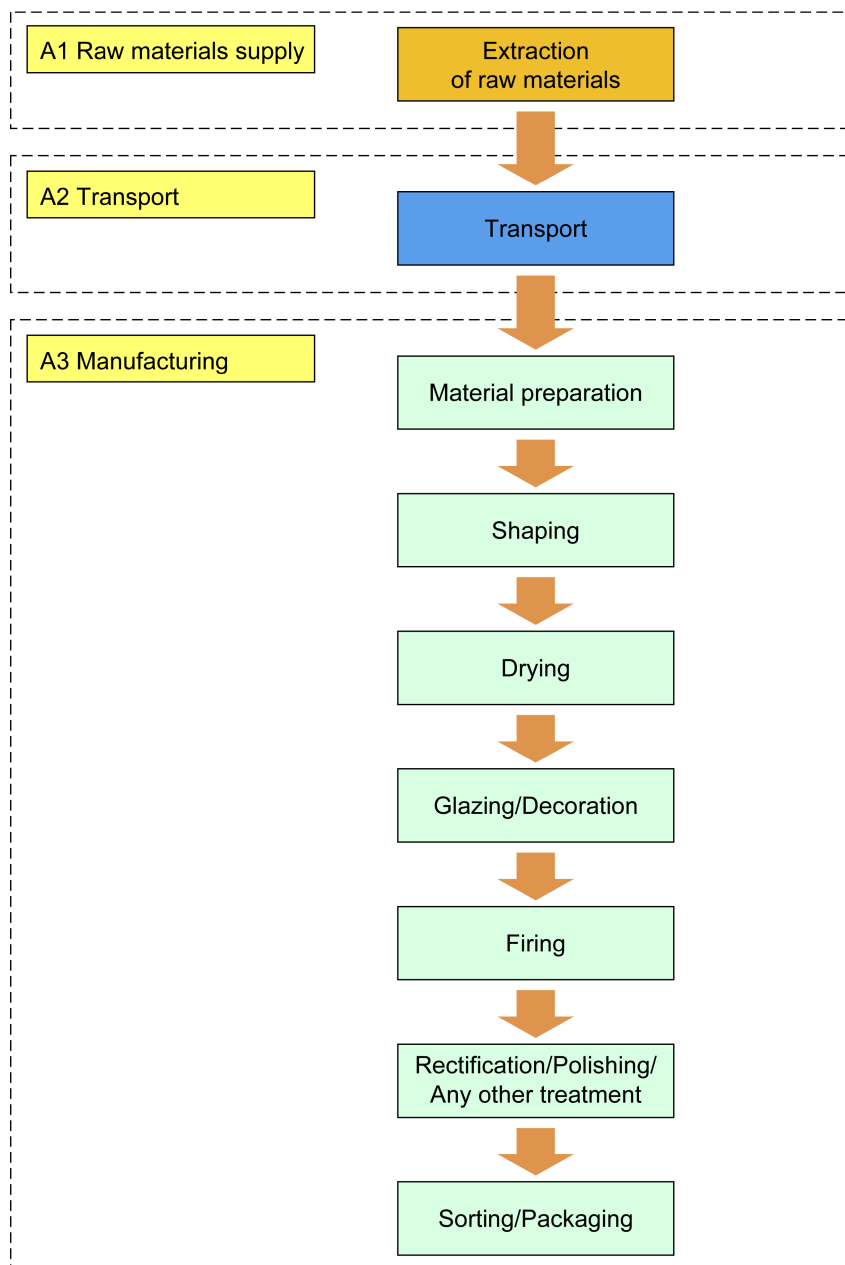


Figure 2 — Example of a cradle-to-gate ceramic tile process flow diagram

6.3.4.2 Product stage

The product stage is an information module required to be included in the EPD. As illustrated in Figure 1 it includes the information modules A1 to A3. The system boundary with nature is set to include those processes that provide the material and energy inputs into the system and the following manufacturing, and transport processes up to the factory gate as well as the processing of any waste arising from those processes.

In the case of input of secondary materials or energy recovered from secondary fuels, the system boundary between the system under study and the previous system (providing the secondary materials) is set where outputs of the previous system, e.g. materials, products, building elements or energy, reach the end-of-waste state (see 6.3.4.5 and Annex B).