GlobalEPD

A VERIFIED ENVIRONMENTAL DECLARATION

AENOR

Environmental Product Declaration

EN ISO 14025:2010
EN 15804:2012+A1:2013

Spanish Ceramic Tiles

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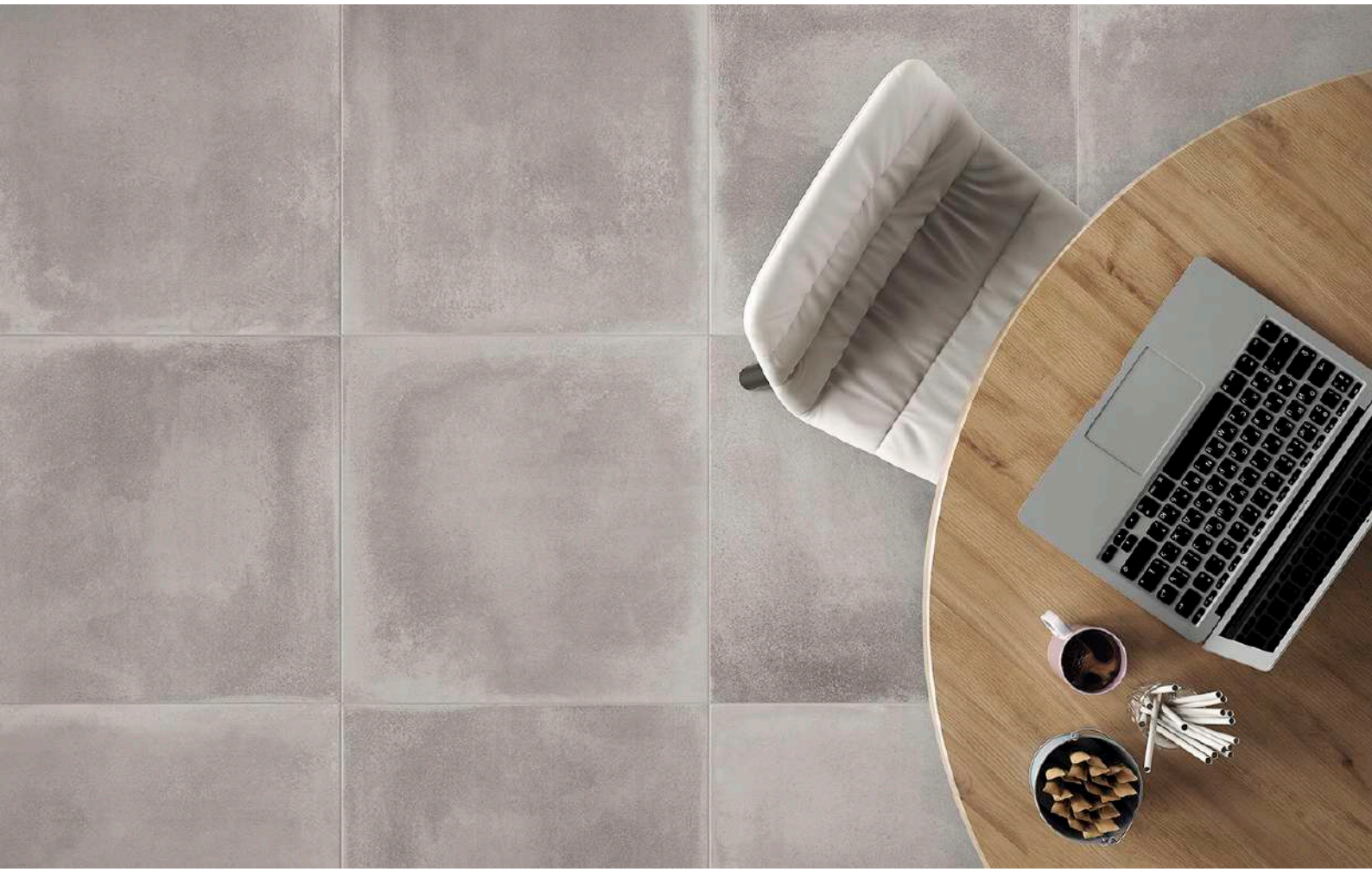
ASCER
Spanish Ceramic Tile Manufacturers' Association

Spanish Ceramic Tile Manufacturers' Association (ASCER)



The EPD holder is responsible for the content of the Declaration. The holder is responsible for keeping the records and documents supporting the content of the Declaration

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CEN standard EN 15804:2012+A1:2013 serves as the core RCP

Independent verification of the declaration and data, according to EN ISO 14025:2010

☐ Internal ☑ **External**

Verification body

AENOR

1 General information

1.1. The organization

The main objective of ASCER (Spanish Ceramic Tile Manufacturers' Association) is to support, defend and promote the general and common interests of the ceramic tile industry, as well as to offer its associates valuable services and help them to improve the management of their companies and to create sustainable competitive advantages. ASCER activities are based on the need or call for joint action in those areas in which companies are unable to successfully tackle individually, or which require a considerable financial outlay. The high representativeness of the Association as well as the geographical concentration of the companies (94% of the production in the province of Castellon) guarantee that any activity will have an immediate and a global diffusion of the sector.

1.2. Scope of the Declaration

This Environmental Product Declaration contains complete environmental information along the life cycle of Spanish ceramic tile manufactured by ASCER´s member companies. The results shown are considered representative of ASCER´s member companies, in a geographical and technological environment of Spain in the year 2017.

The results of the Life Cycle Analysis (LCA) of this EPD are based on data provided by manufacturers of 40% of the Spanish ceramic tile production. The participants have provided all the data and, therefore, it is considered that the results obtained in this study are representative of the Spanish ceramic tile manufacturing sector. The scope of this EPD is form cradle to grave.

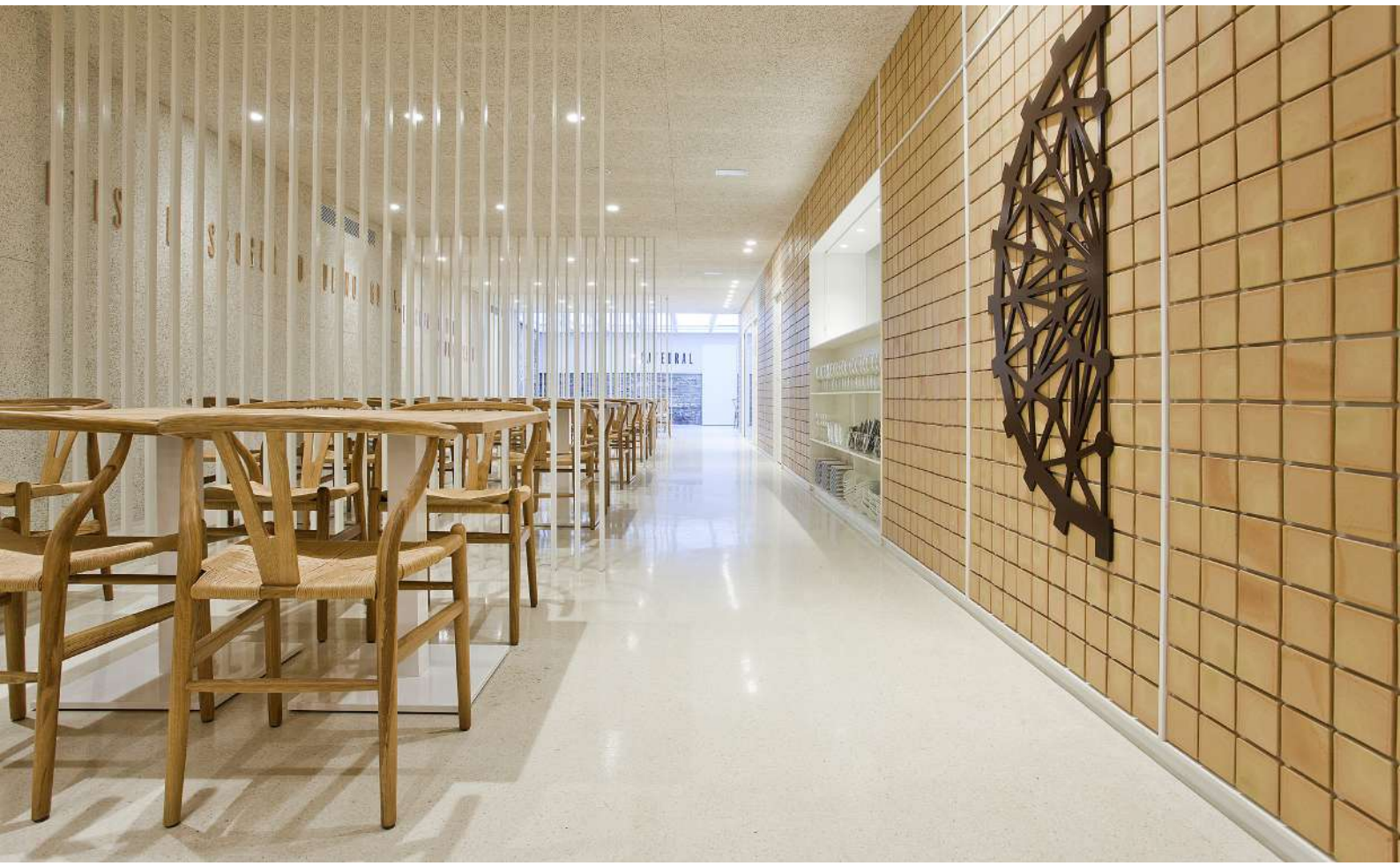

Figure 1. Installed product

1.3. Lyfe cycle and conformity

This EPD has been drawn up and verified according to UNE-EN ISO 14025:2010 and the Product Category Rules (PCR) indicated in table 1.

This EPD includes the life cycle stages indicated in table 2. Thus, this EPD is cradle to grave.

Title	Ceramic tiles
Registration code	GlobalEPD-RCP-002 rev. 1
Issue date	2018/07/11
Conformidad	UNE-EN 15804
Programme	GlobalEPD
Programme Operator	AENOR

Table 1. Information about the PCR

This Declaration cannot be subject to comparison with others as drawn up in other Programmes or in accordance with different reference documents. This EPD is not comparable with other EPD not developed according to the standard EN 15804. In the same way, environmental Declarations cannot be subject to comparison if the origin of the data is different (the data sets, for example), if not all the relevant information modules are included, or if they are not based on the same scenarios.

Comparison of construction products shall be based on the same function, using the same functional unit at building level (or architectural or civil engineering works), i.e. including the performance of the product during the life cycle and the requirements stated in EN ISO 14025, 6.7.2.

Product stage	A1	Raw material supply	X
	A2	Transport to the manufacturer	X
	A3	Manufacturing	X
Construction	A4	Transport to the building site	X
	A5	Installation / construction	X
Use stage	B1	Use	NR
	B2	Maintenance	X
	B3	Repair	NR
	B4	Replacement	NR
	B5	Refurbishment	NR
	B6	Operational energy use	NR
	B7	Operational water use	NR
End of life	C1	De-construction / demolition	NR
	C2	Transport	X
	C3	Waste processing	X
	C4	Disposal	X
	D	Reuse, recovery and/or recycling potentials	X

X = Module included in the LCA; NR = Not Relevant; MNA = Module Not Assessed

Table 2. System boundary. Information modules included

2 The product

2.1. Identification of the product

This EPD collects environmental information on uniaxial pressing or extruded ceramic tiles for floor and/or wall tiles, both indoor and outdoor. This Product Category also includes mosaics, complementary and special pieces which can be of many different sizes and shapes, even non-flat ones. In short, ceramic tiles defined by the EN 14411:2016 Standard (equivalent to ISO 13006:2018) are included. This Standard groups the ceramic tiles according to the forming mode and water absorption group: BIII, BIb/BIIa, BIa, AIIb – AIII, AI – AIIa, AIIb – AIII.

The ceramic tiles presented in this EPD have an average weight of 20.3 kg/m^2.

2.2. Intended use of the product

The product's function is to cover surfaces. The versatility of the ceramic tile allows this type of coverings to be installed in different environments (houses, offices, shops, hospitals, etc.) in interior and exterior environments, as well as covering floors, walls or other surfaces.

Technical specifications of ceramic tiles are listed in EN 14411:2016 Standard. This information will be provided by the manufacturer.

2.3. Composition of the product

Table 3 describes the main components of the produc.

Raw materials	Materials	Content	Units
Body	Clay, feldspar, sand, kaolin, deflocculant, unfired and fired tile scrap	96%	%
Glaze	Feldspar, carbonates, quartz, borates, silicates, kaolin, zirconium oxide, clays, zinc oxide, etc.	4%	%

Table 3. Composition of the product

Figure 2. Installed product

3 Information regarding the LCA

3.1. Life cycle analysis

The Life Cycle Assessment (LCA) study on which this EPD is based has been drawn up from data provided by the Spanish manufacturers, representing 40% of the Spanish ceramic tines manufactured in 2017.

The results in this EPD are shown as an average of the production of the ceramic tiles. This average has been obtained by weighing the data of each collaborating company, by their production.

The LCA on which this declaration is based has been conducted according to the ISO 14040 and ISO 14044 standard, and the GlobalEPD-RCP-002 version 2 for ceramic tiles of the GlobalEPD Programme of AENOR.

This LCA stydy has a "cradle-to-grave" scope.

For further information: https://ascer.es/

3.2. Functional Unit

The Functional Unit is "**covering 1 m² of a surface (floor, walls, façade, others) during 50 years with ceramic tiles**".

3.3. Reference service life

The Reference Service Life (RSL) is the same as that of the building where it is installed, if it is properly installed. It is a long-lasting product that does not require replacement. It has been considered a reference service life of 50 years.

Parameter	Value
Reference service life	Minimum 50 years
Declared product properties (at the gate) and finishes, etc.	Minimum values of the relevant characteristics according to EN14411. For further information, apply for the manufacturer's technical data sheet, for each model.
Design application parameters (manufacturer's instructions), including the references to appropriate practices	For further information, apply for the manufacturer's technical data sheet, for each model.
Assumed quality of work, when installed in accordance with the manufacturer's instructions	For further information, apply for the manufacturer's technical data sheet, for each model.
Outdoor environment (for outdoor applications), e.g. weathering, pollutants, UV radiation and wind exposure, building orientation, shading, temperature	Values of the relevant characteristics according to EN 14411. For further information, apply for the manufacturer's technical data sheet, for each model.
Indoor environment (indoor applications), e.g. temperature, moisture, chemical exposure	Values of the relevant characteristics according to EN 14411. For further information, apply for the manufacturer's technical data sheet, for each model.
Usage conditions, e.g. frequency of use, mechanical exposure	For further information, apply for the manufacturer's technical data sheet, for each model.
Maintenance, e.g. required frequency, type and quality and replacement of replaceable components	For further information, apply for the manufacturer's technical data sheet, for each model.

Table 4. Reference service life

3.4. Allocation and cut-off criteria

In this "cradle-to-grave" LCA study, a cut-off rule of 1% has been applied for the energy use (renewable and non-renewable) and for the mass in all single processes whose data are insufficient. More than 95% of inputs and outputs from energy and matter have been included, excluding not available and not quantifiable dataset.

The excluded dataset are:

- Diffuse particulate emissions generated by transport and storage of powdery raw materials.
- Non-regulated channelled emissions from combustion stage (spray drying, ceramic tiles drying and firing stage).
- The waste recycling and reuse processes generated throughout the life cycle of ceramic tiles based on Product Category Rules (PCR). However, the waste recycling process and their benefits are considered in module D.
- Industrial machinery and equipment manufacture, owing to the lack of currently available data, the cost/complexity of analysis and the relatively low environmental impact per FU compared to other processes in the case of building products. In addition, these processes are not included in the used databases. Waste generated during the maintenance of this machinery and equipment are also excluded due to the low impact caused.

3.5. Representativeness, quality and selection of data

The primary data have been obtained through questionnaires filled in by the Spanish manufacturers, representing 40% of the Spanish ceramic tiles manufactured in 2017. These questionnaires have been individually reviewed and analysed by the authors of the LCA study to ensure data integrity, suitability and traceability.

For secondary data, GaBi databases have been used, compilation 8007 and modelled with GaBi version 8.0.7.18.

All datasets provided by the companies belong to a geographical scenario of Spain 2017.

3.6. Other calculation rules and hypotheses

The information collected from the manufacturers has been statistically treated individually and then a collective treatment has been made: analysing the scattering of the datasets, removing non-logical extremes and finally, making weighted averages by the production of each of the participating companies.

4 System boundaries, scenarios and additional technical information

All Life Cycle modules applicable to ceramic tiles according to PCR have been included.

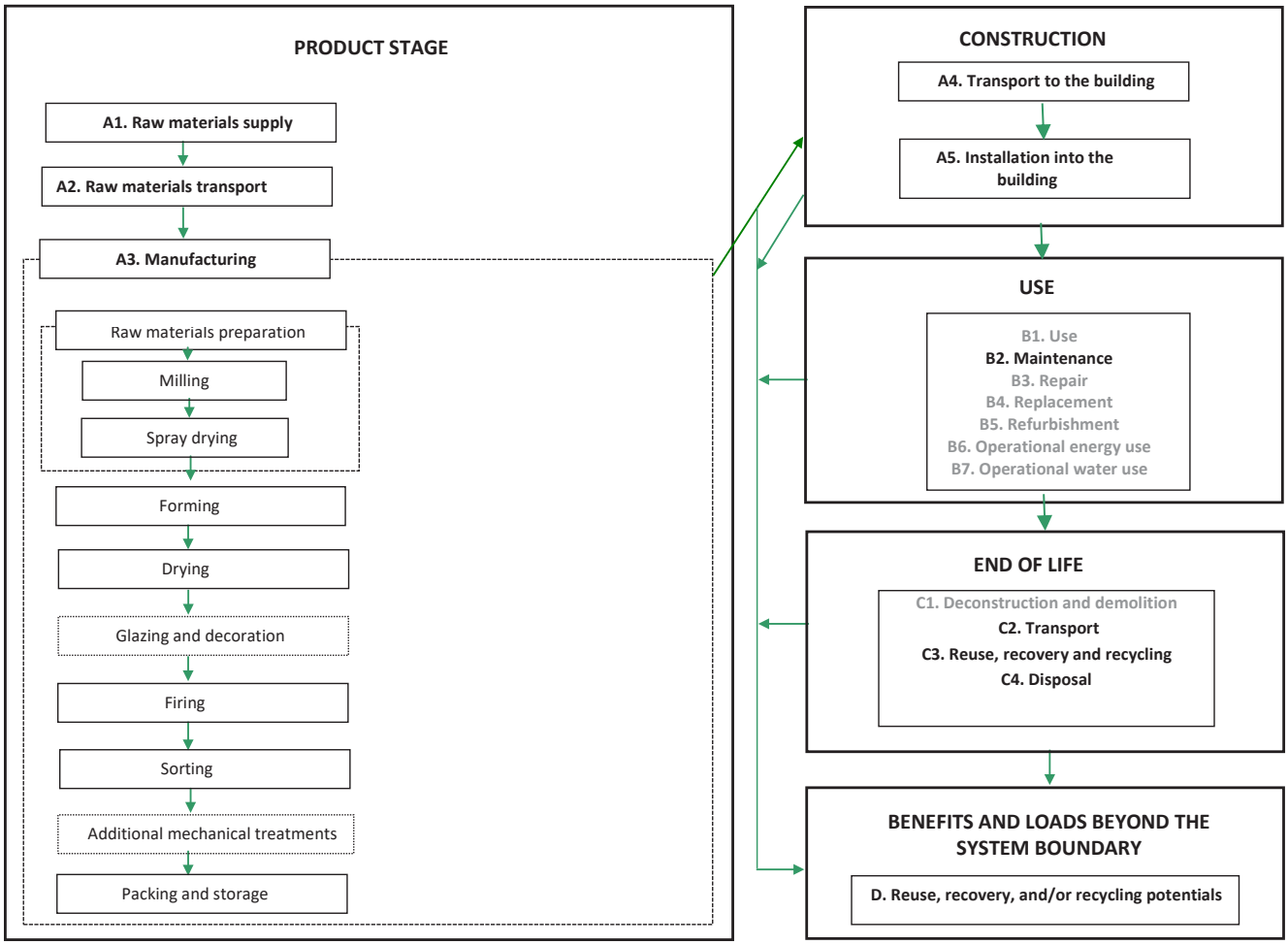

Figure 3. Stages and information modules for the building assessment

4.1. Upstream processes and manufacturing *(A1-A3)*

Raw materials supply and transport *(A1 and A2)*

The basic materials for the manufacture of ceramic tiles are classified in plastic raw materials and non-plastic or degreasing raw material. Their proportion should be appropriate to form the tile and to provide enough raw strength to allow it to be processed. Other raw materials are the waste from the factory itself i.e. sludge, unfired tile scrap and fired tile scrap. These wastes are introduced in the milling stage of the raw materials.

Relative to glazes raw materials, the most common used in the formulation are: quartz, kaolin, borates, alkaline, feldspars, nepheline, calcium carbonate, dolomite, zircon, wollastonite, calcined alumina, additives *(deflocculants, binders, suspending agents...)* with an average frit content of 50%.

Raw materials have different sources according to their nature and properties. Raw materials that have its origin outside Spain are transported to the harbour by ship and then by truck to the manufacturing plants. For transport by sea, a type of transoceanic freighter has been chosen, whose distance travelled differs in each case depending on the origin. All raw materials are transported in bulk, i.e. with no packing.

Manufacturing (A3)

Raw materials are mixed and can be milled through a wet or dry process, being the most popular the wet milling one. The mixture of water and raw materials obtained from the wet process is then spray-dried to obtain the granule.

Most of the spray-driers have cogeneration systems for combined heat and power. All the heated gases generated are used in the spray drying process; part of the electric energy generated is used in the manufacturing process itself, thus reducing the energy demand from the grid and other part is sold to the grid, considering therefore, a coproduct.

The granules are transported to the ceramic tiles factory. The ceramic pieces are formed by dry uniaxial pressing mainly and/or by extrusion. Currently, continuous presses are being installed to obtain tiles pieces of large sizes and reduced thicknesses.

The formed pieces are introduced into a continuous drier to reduce tile moisture content, thus doubling or tripling tile mechanical strength for subsequent processing, thus allowing next processing.

Most of the pieces are decorated with one or more thin layers of ceramic glaze. The body is also decorated with applying different techniques, being the majority, the injection of inks.

Subsequently, the ceramic tiles go on the firing stage that uses natural gas as fuel. The firing is the most important stage in the production process, as the materials have a fundamental change in the properties, obtaining a hard material, resistant to water and to chemical products. The products are subjected to firing cycles with temperatures between 1000-1300ºC.

The search for new effects in ceramic tiles has led to a series of additional treatments to the fired pieces: pre-cutting, cutting, surface polishing, grinding, bevelling, etc.

After the quality control processes, also known as sorting, the pieces are packaged using cardboard, pallets and polyethylene.

4.2. Transport and construction process

Transporte dA4)

Product distribution is as follows: 35% of the product is distributed in Spain, 28% in Europe and 36% to the rest of the world.

For road transport a 27t truck, EURO 6 class is considered. For transcontinental transport, an average transoceanic freighter was considered. All models used are included in the database GaBi version 8.7.0.18..

Parameter	Value	Units
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat etc.	0.17 l diesel oil (camión Euro 6 de 27 t) 0.003 l fuel oil (freighter)	
Distance	35% in Spain (300 km) 28% to the rest of Europe (1390 km) 36% to the rest of the world (6520 km)	km
Capacity utilisation (including empty returns)	85 % for road transport and 100 % for sea transport	%
Bulk density of transported products	415,4	kg/m³
Volume capacity utilisation factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaged products)	0,2	N/A

Table 5. A4 Transport to the building site

Installation process and construction (A5)

The product is then duly unpacked for installation. Data show that, in a real scenario, the ceramic tiles need to be installed with fast-setting mortars. Waste from packaging waste is handled separately depending on the geographic location of the installation site.

Parameter	Value	Units
Ancillary materials for installation (specified by material)	Cementitious adhesive: 2,73 kg	
Water use	0,00068	m^3
Other resource use	Not applicable	
Waste materials on the building site before waste processing, generated by the product's installation (specified by type)	Residuos de embalajes Cardboard: 0,2 Plastic: 0,04 Strip: 0,01 Wood: 0,3	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)	Cardboard for incineration: 0,011 Cardboard for incineration: 0,106 Cardboard to landfill: 0,032 Plastic for incineration: 0,0053 Plastic for recyling: 0,0307 Plastic to landfill: 0,0133 Wood for incineration: 0,019 Wood for recyling: 0,173 Wood to landfill: 0,055	kg
Direct emissions to ambient air, soil and water	Not applicable	

Table 6. A5 Installation of the product in the building

4.3. Use related to the building fabric and the operation of the building

The use stage is divided into the following modules:

- Use (B1)
- Maintenance (B2)
- Repair (B3)
- Replacement (B4)
- Rehabilitation (B5)
- Use of operational energy (B6)
- Use of operational water (B7)

Use (B1)

Once installed, the Glazed tile product requires no further energy input for use, nor does it call for maintenance, except normal cleaning operations. For this reason, of all the modules listed above, only the environmental impacts attributable to product maintenance are applicable (module B2).

The reference service life (RSL) of the product is the same as that of the building where it is installed because, provided it is properly installed, it is a durable product that will not require replacement. A RSL of 50 years has been considered.

Maintenance (B2)

Cleaning is performed with a moist cloth and, if the surface exhibits any dirt or grease, cleaning agents such as detergents or bleaches can be added. In this study it has been considered the PCR's scenario according to the site of the installation:

- Cleaning frequency of wall coverings: three times a year.
- Cleaning frequency of floor coverings: once a week with water and once every two weeks with water and detergents.

The consumption of water and detergent to be taken into account are: 0,1 l water/m2 and 0,134 ml detergent/m^2. The values used for the calculation of environmental impacts have been obtained from weightings for the productions provided by the participating companies.

Parameter	Value
Maintenance process	0.62 times a week (water+detergent)*
Maintenance cycle	Not applicable
Auxiliary materials for maintenance (specify materials)	Detergent: 1.34E-04 kg/cleaning
Wastage material during maintenance (specify materials)	Not applicable
Net fresh water consumption	0,1 l water/cleaning
Energy input during maintenance, energy carrier type and amount, if appli-cable and relevant	Not applicable

Table 7. Use stage. B2 Maintenance

* According to PCR 2 V.02 GlobalEPD. Weightings by wall and floor coverings. Cleaning frequency of wall coverings: three times a year; wash frequency of floor coverings once a week with water and twice a month with water and detergent.

4.4. End of life

Deconstruction and demolition (C1)

When its service life has ended, the product will be removed, either as part of building refurbishment or building demolition. In building demolition, the impacts assignable to product disassembly are negligible.

Transport (C2)

Product wastes are transported in a truck according to Euro 6 standards, over 50km to the destination.

Waste processing (C3)

According to the distribution sites of the ceramic tiles declared by de manufacturers (A5) and to the last statistics dates (Eurostat, 2016), 75% of the construction and demolition waste is assumed to go to reuse, recovery and recycling.

Final disposal (C4)

25 % of the product is sent to a controlled landfill.

Parameter	Value	Units
Collection process	0	kg collected separately
	23	kg collected with construction waste mixture
Recovery system specified by type	0	kg for reuse
	17,3	kg for recycling
	Not applicable	kg for energy recovery
Distance to disposal	50	km
Disposal	5	kg
Assumptions for scenario development, e.g. transportation	The product waste is transported by truck (24 t) that complies with Euro III regulations. A distance of 50 km is considered, both to the point of final disposal and to the recycling plant. It also includes the return trip of the truck (100% of empty returns) according to the typical scenarios included in the PCR.	

Table 8. End of life

4.5. Benefits and loads beyond the system boundary

It is assumed that there are avoided loads in the manufacturing (such as cardboard, film and wood waste), in product installation (such as cardboard, plastics and wood packing waste) and in product end of life.

5 Declaration of the environmental parameters of the LCA and LCI

The following table includes the average data from the LCA.

	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	10,7	3,8E-01	5,2E-01		3,9E-02							8,8E-02	0	6,1E-02	-2,7E-01
ODP	5,9E-08	1,0E-14	2,6E-13		1,3E-10							2,4E-15	0	6,2E-14	-4,6E-09
AP	1,7E-02	3,3E-04	8,0E-04		4,1E-05							6,7E-05	0	3,6E-04	-10,0E-04
EP	2,8E-03	7,0E-05	1,7E-04	NR	2,0E-05	NR	NR	NR	NR	NR	NR	1,6E-05	0	4,9E-05	-1,1E-04
POCP	1,5E-03	4,3E-05	7,0E-05		3,6E-06							9,7E-06	0	2,8E-05	-1,1E-04
ADPE	2,5E-05	3,1E-08	7,3E-07		6,9E-09							7,2E-09	0	2,2E-08	-5,3E-08
ADFP	148,1	5,1	2,5		2,2E-01							1,2	0	7,9E-01	-6,3

GWP	*[kg CO_2 eq]*	Global warming potential
ODP	*[kg CFC-11 eq]*	Depletion potential of the stratospheric ozone layer
AP	*[kg SO_2 eq]*	Acidification potential of soil and water
EP	*[kg $(PO_4)^{3-}$ eq]*	Eutrophication potential
POCP	*[kg etileno eq]*	Formation potential of tropospheric ozone
ADPE	*[kg Sb eq]*	Abiotic depletion potential for non fossil resources
ADPF	*[MJ]*	Abiotic depletion potential for fossil resources

Table 10. Parameters describing environmental impacts defined in EN 15804

	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	15,3	2,8E-01	5,9E-01	NR	1,7E-02	NR	NR	NR	NR	NR	NR	6,6E-02	0	9,5E-02	-1,3
PERM	0	0	0		0							0	0	0	0
PERT	15,3	2,8E-01	5,9E-01		1,7E-02							6,6E-02	0	9,5E-02	-1,3
PENRE	154,3	5,1	2,8		2,2E-01							1,2	0	8,1E-01	-6,9
PENRM	0	0	0		0							0	0	0	0
PENRT	154,3	5,1	2,8		2,2E-01							1,2	0	8,1E-01	-6,9
SM	0	0	0		0							0	0	0	0
RSF	0	0	0		0							0	0	0	0
NRSF	0	0	0		0							0	0	0	0
FW	3,4	2,2E-02	2,2E-01		1,0E-01							5,2E-03	0	4,5E-02	-3,2E-01

PERE *[MJ]* Use of renewable primary energy excluding renewable primary energy resources used as raw materials

PERM *[MJ]* Use of renewable primary energy resources used as raw materials

PERT *[MJ]* Total use of renewable primary energy resources

PENRE *[MJ]* Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials

PERNRM *[MJ]* Use of non renewable primary energy resources used as raw materials

PERNRT *[MJ]* Total use of non renewable primary energy resources

SM *[MJ]* Use of secondary material

RSF *[MJ]* Use of renewable secondary fuels

NRSF *[MJ]* Use of non renewable secondary fuels

FW *[m³]* Net use of fresh water

Table 11. Parameters describing resource use

	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	1,4E-01	0	0		0							4,5E-02	4,5E-02	4,5E-02	4,5E-02
NHWD	62,8	1,9E-02	8,0E-01		4,5E-02							3,4E-06	3,4E-06	3,4E-06	3,4E-06
RWD	1,9E-03	7,0E-06	1,3E-04		3,4E-06							4,5E-02	4,5E-02	4,5E-02	4,5E-02
CRU	0	0	0		0							0	0	0	0
MFR	0	0	1,3E-01	NR	0	NR	NR	NR	NR	NR	NR	0	11,3	0	-1,3E-01
MER	0	0	0		0							0	0	0	0
EET	0	0	0		0							0	0	0	0
EET	0	0	0		0							0	0	0	0

HWD	*[kg]*	Hazardous waste disposed
NHWD	*[kg]*	Non hazardous waste disposed
RWD	*[kg]*	Radioactive waste disposed
CRU	*[kg]*	Components for re-use
MFR	*[kg]*	Materials for recycling
MER	*[kg]*	Materials for energy recovery
EE	*[MJ]*	Exported electric energy
EET	*[MJ]*	Exported thermal energy

Table 12. Parameters describing output flows and waste categories

6 Additional environmental information

6.1. Release to indoor air

In the ceramic tiles manufacturing process, tiles are subjected to a thermal process above 1000ºC. At these temperatures, any organic compound in the compositions decomposes, yielding an inert end-product free of any volatile organic compounds that might be released in the use stage.

6.2. Release to soil and water

Ceramic coverings release no compounds into the soil or water during their use stage because a completely inert product is involved that undergoes no physical, chemical, or biological transformations, is neither soluble nor combustible, and does not react physically or chemically or in any other way, is not biodegradable, and does not adversely affect other materials with which it enters into contact such that it might produce environmental pollution or harm human health. It is a non-leaching product, so that it does not endanger the quality of surface water or groundwater.

Figure 4. Installed product

References

[1] General Instructions of the GlobalEPD Programme, 2nd revision. AENOR. February 2016

[2] EN ISO 14025:2010 Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006)

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

[4] GlobalEPD-RCP-002 Ceramic coverings. AENOR.

[5] Life cycle assessment for sectorial ceramic coverings. Report reference C184570 (ITC-AICE).

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A verified enviromental declaration

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