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A VERIFIED ENVIRONMENTAL DECLARATION

Environmental product declaration

Ceramic tiles, porcelain tiles

(BIa clasification according to EN 14411:2013)

EN ISO 14025:2010
EN 15804:2012

Designation Code: GlobalEPD 002-038
Date of first issue: 19/02/2016
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Porcelánicos HDC

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1 General information

1.1. Identification and description of the organisations carrying out the declaration

Declaration made by:
Instituto de Tecnología Cerámica – (ITC-AICE)
Cyclus Vitae Solutions S.L.

Life Cycle Assessment made by:
Instituto de Tecnología Cerámica – (ITC-AICE).
Report reference C152064, 4 of November 2015.

Commissioned by:
PORCELÁNICOS HDC, S.A.
Ctra. CV-160. Km. 16,8
12192 Villafamés, Castellón. Spain.

1.2. Identification of the product

This environmental product declaration describes the environmental information based on a life cycle assessment of ceramic tiles manufactured by PORCELÁNICOS HDC, S.A. considering the geographical and technical coverage of Spain during 2014.

The ceramic tiles included in the study belong to the BIa water absorption group according to UNE-EN 14411:2013 (equivalent to ISO 13006:2012); i.e. they have a water absorption ≤ 0,5% (porcelain tiles).

The product sizes (in cm x cm) that lie within the scope of the study have a thickness between 8,3 mm and 11,6 mm and are as follows.

14,6x29,6	14,6x59,4	29,6x29,6	29,6x59,4
30x60	30x60 (structured)		32x32
33,3x33,3	33,3X65	45x45	59,4x59,4
60x60	59,4x89	60x90	45x65

1.3. Declared or functional unit

The Functional Unit is "1 m² covering of a surface (floor) with porcelain tiles (BIa group) during 50 years".

Figure 1 – Installed product

1.4. Name of the Program

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AENOR is a founding member of the Association ECO Platform of European EPD Program Operators.

1.5. Conformity

This Environmental Product Declaration has been developed and verified in accordance with ISO 14025 and EN 15804.

1.6. Identification of the Product Category Rules (PCR)

Descriptive title of the PCR	Ceramic coverings
Panel that approved this PCR	CERAMIC COVERINGS
PCR registration date and code	2013-09-06 RCP-002-AENOR GlobalEPD EN 15804 serves as core PCR
PCR version number	001
Public consultation period for the PCR	2013-05-07 to 2013-05-31
Approval date of the PCR	2013-09-06
PCR valid until	2018-09-05
Programme Operator	AENOR

1.7. Date of issue of the declaration and period of validity

This EPD, with code GlobalEPD 002-038 is issued on 2016-02-19 and will be valid for 5 years.

1.8. Information modules

This EPD refers to the environmental performance of the ceramic tiles manufactured by PORCELÁNICOS HDC, S.A., considering a full life cycle (cradle to grave) including:

Product stage:

- Raw materials supply (A1)
- Transport (A2)
- Manufacturing (A3)

Construction:

- Transport (from the gate of the factory to the constrution site) (A4)
- Installation and construction processes (A5)

Use:

- Use (B1)
- Maintenance (B2)
- Repair (B3)
- Replacement (B4)
- Refurbishment (B5)
- Operational energy use (B6)
- Operational water use (B7)

End of life:

- De-construction / demolition (C1)
- Transport to waste processing (C2)
- Waste processing for reuse, recovery and/or recycling (C3)
- Disposal (C4)

Benefits and loads beyond the system boundary (reuse, recovery and/or recycling potentials)

- Module D

Product stage

Raw materials supply and transport (A1 and A2)

The basic materials for these tiles are mainly clay, feldspar, sand, and a thin layer of glaze, mainly composed by quartz, kaolin, alkaline feldspars, calcium carbonate, borates, zircon, clay, calcined alumina, ceramic frits, pigments, and additives such as suspending agents, defloculants, or binders.

Raw materials have different sources according to their nature and properties. Raw materials with origin outside Spain are transported to the Castellon harbour by ship and then by truck to the factory. For maritime transports a transoceanic cargo freighters was chosen; the distance used is based on the point of origin. All raw materials are transported in bulk, i.e. with no packing.

Manufacturing (A3)

Both the preparation of the raw materials and the manufacturing of the tiles are made in two dedicated facilities, located at 25 km from the PORCELÁNICOS HDC factory. These organizations receive the different raw materials and store them until the mix is prepared.

Once the mix of raw materials is prepared, it is grinded with a wet process and then dried to obtain a spray-dried granule.

The two organization providing the spray-dried granules include a system of cogeneration for combined heat and electric power. In this cogeneration process electricity is generated using a system of gas turbines and alternators. All the heated gases generated are used in the atomization 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.

The atomized granules, once manufactured, are transported in bulk in 27 t trucks to the PORCELÁNICOS HDC factory. In the factory the spray-dried powder is stored in storage hoppers. Using a feed system of conveyor belts with weight control, the granules are conveyed to the forming stage.

The tiles are then formed by dry uniaxial pressing. The formed pieces are introduced into a continuous dryer to reduce tile moisture content, thus doubling or tripling tile mechanical strength for subsequent processing, thus allowing the next processing.

Once the tiles are removed from the dryer they are decorated with one or more thin layers of ceramic glaze. This glaze is manufactured in specialized factories, where part of the raw materials is subjected to a fritting process (raw materials fusion and quenching) to obtain insoluble glasses. The frits and other raw materials are mixed and, generally, wet milled; then the glaze is applied on the body with different techniques such as bell glazing and airbrushes.

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 fired in single-channel roller kilns.

Part of the pieces are sent to speciallized organizations for mechanical processes like cuts, surface polishing or beveling.

After the quality control processes, also known as sorting, the pieces are packaged using cardboard, pallets, and polyethylene. Once the pallet is prepared is stored in the logistic area of the factory.

Construction

Transport to the building site (A4)

15% of the product is distributed in Spain, 48% in Europe and 37% to the rest of the world.

For road transport a 27 t truck, EURO III class, was considered. For transcontinental transport, an average transoceanic freighter was considered.

All models used are included in the database [GaBi 4.4].

Installation into the building (A5)

Once the product unpacked for installation, it's installed in the building. According to the data used and to be applied in a real scenario, the tiles are be installed with fast-setting mortars.

Fast-setting mortars are cementitious adhesives that consist of a mixture of hydraulic binders, mineral fillers, and organic additives, which only need to be mixed with water or a liquid addition just before use. These mortars consist of a mixture of grey or white cement, mineral fillers of a siliceous and/ or limestone nature, and organic additives: water retainers, water-redispersible polymers, rheological modifiers, fibres, etc.

Waste from packaging waste is handled separately depending on the geographic location of the installation site.

Use

Once installed, the tile requires no energy input for use nor require any maintenance after installation, except normal cleaning operations. Consequently, of all the modules mentioned previously, only the environmental loads relating to product maintenance are considered (Module B2).

According to PORCELÁNICOS HDC, the reference service life 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.

The reference service life of the product is 50 years.

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 the study it has benn considered water and disinfectant consumption in a residential use scenario: that is a cleaning once a week.

End of life

Deconstrucción 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 III standards, over a distance of 50 km to the destination.

In order to estimate the 50 km between the demolished building and the nearest controlled landfill, only the Spanish market was considered, and the results were extrapolated to the entire ceramic market. In Spain, there are currently more than 80 authorised CDW (construction and demolition waste) landfills.

This waste landfills are more concentrated in certain areas like Catalonia,

Aunque estos vertederos controlados se encuentran más concentrados en determinadas áreas como Cataluña (55%), Galicia (12%) or Andalusia (11%); it is considered that the main spanish cities have located near one of this installation.

Waste processing for reuse, recovery and/or recycling (C3)

According to the Royal Decree 105/2008 and the Waste Framework Directive, as well as to the European Union agreements, 70% of the construction and demolition waste is assumed to go to reuse, recovery, and recycling.

Final disposal (C4)

30% of the product is sent to a controlled landfill.

Benefits and loads beyond the system boundary, information module from reuse, recovery and/or recycling (D)

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 packaging waste) and in product end of life.

1.9. Representativeness of the EPD

This Environmental Product Declaration contains environmental information regarding a group of tiles from a single manufacturer, PORCELÁNICOS HDC, S.A.

The results presented set out the average environmental performance of the porcelain tiles, weighted by the production. In addition this EPD includes the environmental data on the tiles that exhibit a minimum and a maximum impact, thus delimiting the average results obtained in the LCA.

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.

EPD from different type III program operators might be not directly comparable as the assumptions, scope and calculation rules might be different.

1.10. Where can further information on this EPD be obtained?

For further information regarding the project report of the LCA study for ceramic tiles manufactured by PORCELÁNICOS HDC, S.A . might be requested. To access this data, please contact the manufacturer:

www.porcelanicoshdc.es
hdc@porcelanicoshdc.es

Figure 2 – Installed product

2 Product

2.1. Description of the product

Ceramic tiles from the water absorption group BIa (porcelain tiles); the classification is based on EN 14411:2013:2013 (equivalent to ISO 13006:2012), considering a geographical and technical coverage of Spain with data from 2014.

The formats included in the study are the following (in cm x cm):

14,6x29,6	14,6x59,4	29,6x29,6	29,6x59,4
30x60	30x60 (structured)		32x32
33,3x33,3	33,3X65	45x45	59,4x59,4
60x60	59,4x89	60x90	45x65

The results of the formats included in the study, with minimum and maximum environmental impact, can be found in the annexes.

2.2. Application of the product

The intended use of the product is surface covering. In this study the environmental performance for indoor flooring in homes has been assessed.

However, the versatility of the ceramic tile also allows the installation in different environments such as offices, shops, hospitals, etc., both indoor and outdoor, and also for such as wall or other surfaces cladding.

The life cycle assessment (LCA) on which this declaration is based was performed according to standards ISO 14040 and ISO 14044, and the PCR document on ceramic coverings v. 01, RCP nº 2 of AENOR GlobalEPD.

The Functional Unit is "1 m^2 covering of a surface (floor) with porcelain tiles (water absorption group BIa) during 50 years".

This LCA is "cradle-to-grave"; i.e. it includes the product, construction/installation, use and end of life stages.

2.3. Product components

None of the end-product components are included in the Candidate List of substances of very high concern for authorisation.

Body raw materials (97%): clay, feldspars, sand and recycled fired and unfired ceramic material and deflocculants.

Glaze raw materials (3%): feldspars, carbonates, quartz, borates, silicates, kaolins, zirconium oxides, clays, alumina, and zinc oxide.

3 Results of the life cycle assessment (LCA)

3.1. System boundaries. Information modules

The stages and information modules included in the scope of this EPD are shown below.

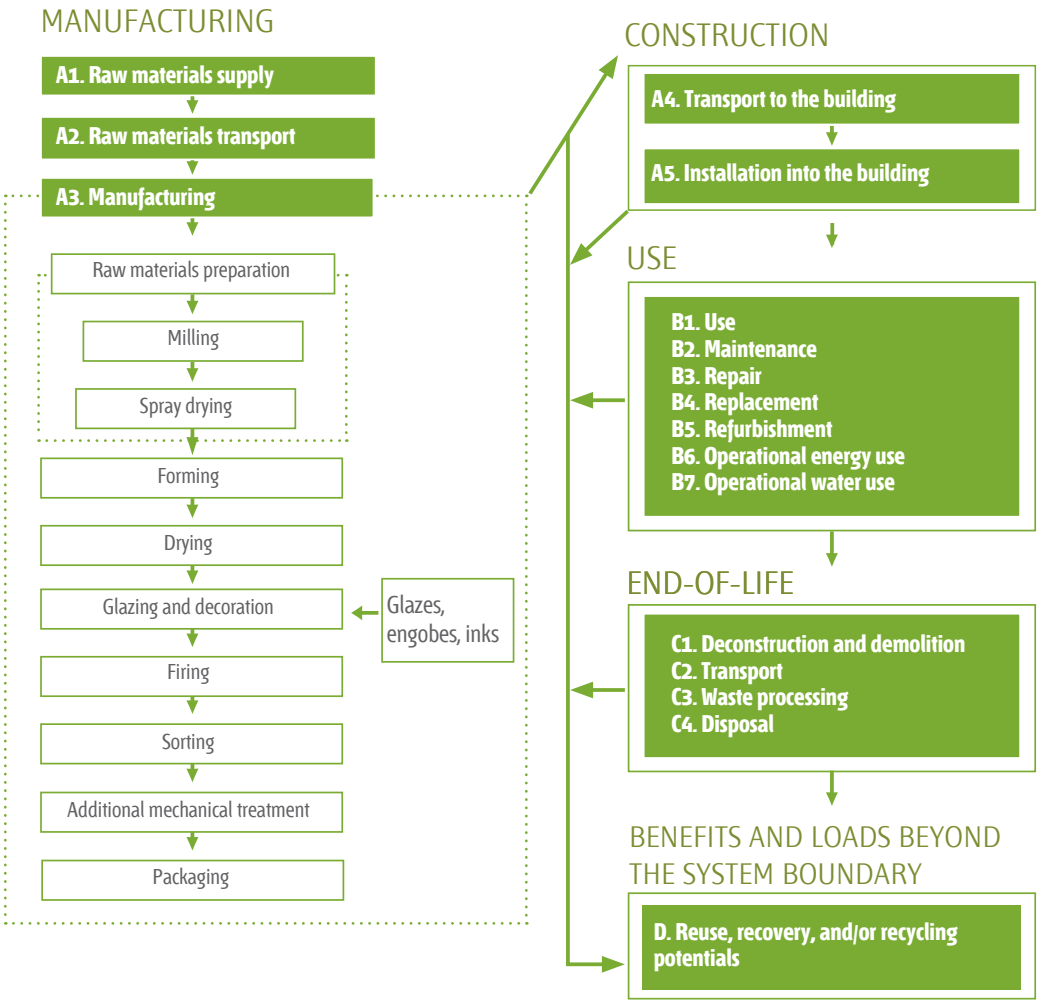

Figure 3. Stages and information modules for the building assessment. Building life cycle

3.2. Declaration of environmental parameters derived from LCA

The environmental parameters derived from the LCA for the products under study are set out below.

3.2.1 Impact indicators

The following tables present the environmental data.

The values of the impacts for the dimensions with minimum and maximum environmental impact included in the scope of this Environmental Product Declaration are detailed in Annexes I and II.

The LCA was developed with the life cycle analysis software GABI 4.4 (PE International). The characterization factors used are the factors included in the CML-2001 method, after the review of November de 2009.

Modules not included in the table are not relevant from an environmental perspective, accoriding to the PCR for ceramic coverings v. 01, RCP nº2 of AENOR GlobalEPD.

IMPACT CATEGORY	PARAMETER	UNIT	LIFE CYCLE STAGES										
			PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
			A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Global warming	Global warming potential	kg CO_2 equiv	11,3	1,4	5,5E-01	N.R	1,5E-01	N.R.	N.R.	1,9E-01	0	1,7E-01	-1,7E-01
Ozone depletion	Ozone depletion potential	kg CFC-11 equiv	7,3E-07	2,7E-09	9,6E-09		5,4E-08			3,8E-10	0	1,5E-09	-1,9E-08
Acidification for soil and water	Acidification potential of soil and water	kg SO_2 equiv	3,8E-02	1,3E-02	5,1E-04		9,1E-04			9,6E-04	0	6,1E-04	7,8E-05
Eutrophication	Eutrophication potential	kg $(PO4)^{3-}$ equiv	4,2E-03	1,8E-03	2,4E-04		1,6E-04			1,9E-04	0	9,0E-05	-3,7E-05
Photochemical ozone formation	Photochemical ozone formation potential	kg Ethene equiv	3,1E-03	1,0E-03	6,0E-05		2,6E-04			1,1E-04	0	1,1E-04	-4,6E-06
Depletion of abiotic resources - elements	Abiotic depletion potential for non fossil resources	kg Sb equiv	1,9E-05	3,2E-08	6,6E-05		2,2E-07			4,5E-09	0	1,1E-09	5,4E-09
Depletion of abiotic resources – fossil fuels	Abiotic depletion potential for fossil resources	MJ (net calorific value)	145,0	18,7	4,1		1,3			2,6	0	1,2	-1,4

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table 1. Parameters describing environmental impacts for porcerlanic tiles (BIa) [average values]

3.2.2 Use of resources

The following table shows the parameters that describe the use of resources associated to the life cycle for 1 m² of average porcelain tiles.

The values of the impacts for the dimensions with minimum and maximum environmental impact included in the scope of this Environmental Product Declaration are detailed in the Annexes.

		LIFE CYCLE STAGES										
		PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
PARAMETER	UNIT	A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	19,4	3,4E-02	5,7E-02	N.R.	2,1	N.R.	N.R.	4,9E-03	0	8,8E-02	3,6E-01
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	19,4	3,4E-02	5,7E-02	N.R.	2,1	N.R.	N.R.	4,9E-03	0	8,8E-02	3,6E-01
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ, net calorific value	211,7	19,0	5,2	N.R.	2,0	N.R.	N.R.	2,6	0	1,3	-2,0
Use of non renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
Total use of non renewable primary energy resources	MJ, net calorific value	211,7	19,0	5,2	N.R.	2,0	N.R.	N.R.	2,6	0	1,3	-2,0
Use of secondary material	kg	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
Use of non renewable secondary fuels	MJ, net calorific value	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
Net use of fresh water	m³	6,5E-02	5,3E-04	1,1E-03	N.R.	3,0E-01	N.R.	N.R.	7,8E-05	0	2,2E-03	-1,8E-02

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table 2. Parameters describing use of resources for porcelain tiles (BIa) [average values]

3.2.3. Waste categories and output flows

The following table shows the parameters that describe waste categories and other output flows associated to the life cycle for 1 m² of average porcelain tiles.

The values of the impacts for the dimensions with minimum and maximum environmental impact included in the scope of this Environmental Product Declaration are detailed in the Annexes.

PARAMETER	UNIT	LIFE CYCLE STAGES										
		PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2,6E-02	0	3,0E-03	N.R.	1,8E-05	N.R.	N.R.	0	0	0	1,0E-04
Non hazardous waste disposed	kg	87,1	5,9E-02	7,2E-01	N.R.	2,4E-02	N.R.	N.R.	8,5E-03	0	16,5	8,0
Radioactive waste disposed	kg	8,2E-03	3,4E-05	1,3E-04	N.R.	3,7E-06	N.R.	N.R.	4,8E-06	0	0	2,4E-04

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table 3. Parameters describing waste categories for porcelain tiles (BIa) [average values]

PARAMETER	UNIT	LIFE CYCLE STAGES										
		PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Components for re-use	kg	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
Materials for recycling	kg	0	0	2,0E-01	N.R.	0	N.R.	N.R.	0	19,1	0	-1,6E-02
Materials for energy recovery	kg	0	0	6,8E-02	N.R.	0	N.R.	N.R.	0	0	0	0
Exported energy	MJ per energy carrier	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table 4. Parameters describing other output flows for porcelain tiles (BIa) [average values]

3.3. Additional environmental information

In 2014 Porcelánicos HDC invested in improvements on the kiln to increase efficiency in gas consumption. This solution conveys the heated intake air from the longterm cooling and final cooling modules to the combustion air fan. Then, the recovered heated air is conveyed through the heat exchanger and subsequently sent to the burners. Thus, the combustion air is preheated and is sent to the burners at a temperature around 170ºC.

This improvement produces energy savings of approximately 4-5% in gas consumption and, as a consequence, a reduce in the volume of gas emission.

3.4. Additional information regarding the release of dangerous substances into indoor air, soil and water during use stage

3.4.1. Indoor air emissions

In the ceramic tile manufacturing process, tiles are subjected to a thermal process above 1000 ºC. 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.

3.4.2. Release to soil and water

Ceramic tiles 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.

3.5. Scenarios and additional environmental information

3.5.1. Module A4: Transport to the building site

PARAMETER	UNIT (expressed per functional or declared unit)	RESULT (expressed per functional or declared unit)
Fuel type and consumption	Litre of fuel type per distance and type of vehicle	0,4 l diesel oil (27 t truck) 0,06 l fuel oil (freighter)
Distance	km	15% in Spain (500 km) 48% to the rest of Europe (2.000 km) 37% to the rest of the world (10.000 km)
Capacity utilisation (including empty returns)	%	85% in trucks 100% freighter
Bulk density of the transported products	kg/m³	415,4 kg/m3
Volume capacity utilisation factor (factor: = 1 or < 1 or ≥ 1 for compressed or nested packaged products)	Not applicable	0,20

Table 5. Technical information. Construction process stage. Transport to the building site

3.5.2. Module A5: Installation or construction

PARAMETER	UNIT (expressed per functional or declared unit)	RESULT (expressed per functional or declared unit)
Material 1: Cementitious adhesive	kg	1,3 kg/m²
Use of fresh water	m³	0,0003 m³
Use of other resources	kg	Not applicable
Quantitative description of energy type (regional mix) and consumption during the installation process	kWh or MJ	Not applicable
Wastage of materials on the construction site before waste processing, generated by the product's installation (specified by type)	kg	Packaging waste: - Cardboard: 0,16 kg - Plastics: 0,02 kg - Wood: 0,33 kg
Output materials (specified by type) as a result of waste processing at the construction site	kg	Incineration of cardboard: 0,0152 kg Recycled cardboard: 0,0792 kg Landfill disposal of cardboard: 0,0688 kg Incineration of plastics: 0,0038 kg Recycled plastics: 0,0034 kg Landfill disposal of plastics: 0,0101 kg Incineration of wood: 0,0794 kg Recycled wood: 0,1434 kg Landfill disposal of wood: 0,1079 kg
Direct emissions to ambient air, soil, and water	kg	Not applicable

Table 6. Technical information. Construction process stage. Installation in the building

3.5.3. Modules B1-B7: B2 Maintenance

PARAMETER	UNIT (expressed per functional or declared unit)	RESULT (expressed per functional or declared unit)
B2 MAINTENANCE		
Maintenance process	Description or source where description can be found	Washing once a week (residential use)
Maintenance cycle	Number per RSL or year	Not applicable
Ancillary materials for maintenance (e.g. cleaning agent) (specify materials)	kg/cycle or other units	Detergent: 0,05 kg/life
Wastage material during maintenance (specify materials)	kg	Not applicable
Net fresh water consumption	m³	0,26 m³/life
Energy input during maintenance (e.g. vacuum cleaning), energy carrier type (e.g. electricity) and amount, if applicable and relevant	kWh	Not applicable

Table 7. Technical information. Use stage related to the building fabric

3.5.4. Reference service life

PARAMETER	UNIT (expressed per functional or declared unit)	RESULT (expressed per functional or declared unit)
Reference service life	Years	Minimum 50 years
Declared product properties (at the gate) and finishes, etc.	Units as appropriate	Information included in the manufacturer's technical data sheet, for each model
Design application parameters (manufacturer's instructions), including the references to appropriate practices	Units as appropriate	Information included in the manufacturer's technical data sheet, for each model
Assumed quality of work, when installed in accordance with the manufacturer's instructions	Units as appropriate	Please visit the website for installation and cleaning guidelines www.porcelanicoshdc.es
Outdoor environment (for outdoor applications), e.g. weathering, pollutants, UV radiation and wind exposure, building orientation, shading, temperature	Units as appropriate	Values of the relevant characteristics according to EN 14411. Information included in the manufacturer's technical data sheet, for each model
Indoor environment (indoor applications), e.g. temperature, moisture, chemical exposure	Units as appropriate	Values of the relevant characteristics according to EN 14411. Information included in the manufacturer's technical data sheet, for each model
Usage conditions, e.g. frequency of use, mechanical exposure	Units as appropriate	Information included in the manufacturer's technical data sheet, for each model
Maintenance, e.g. required frequency, type and quality and replacement of replaceable components	Units as appropriate	Please visit the website for installation and cleaning guidelines www.porcelanicoshdc.es

Table 8. Technical information. Reference service life

3.5.5. Module C1-C4: End of life stage

PARAMETER	UNIT (expressed per functional or declared unit)	RESULT (expressed per functional or declared unit)
Collection process specified by type	kg collected separately	0 kg
	kg collected with mixed construction waste	27,3 kg
Recovery system specified by type	kg for reuse	0 kg
	kg for recycling	19,1 kg
	kg for energy valorization	Not applicable
Disposal specified by type	kg product or material for final deposition	8,2 kg to a controlled landfill
Assumptions for scenario development (e.g. transportation)	Units as appropriate	The product waste is transported in a large-tonnage truck (24 t) that meets Euro III standard. A distance of 50 km is assumed both to the final disposal site and to the recycling plant. A truck return trip (100% empty returns) is also included in accordance with the typical scenarios in the PCR V.001 for ceramic coverings

Table 9. Technical information. End of life stage

4 Verification

EN 15804 serves as core PCR

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

☐ **internal** ☑ **external**

Third party verifier

AENOR Asociación Española de Normalización y Certificación

NOTE 1: EPD from different Programme Operators might not be directly comparable due to potential differences in the assumptions, scope and calculation rules. For comparison construction EPD shall be based in EN 15804.

NOTE 2: Comparison of construction products shall be based on a functional equivalence, using the same functional unit at building (or civil engineering works) level, i.e. including the product performance during its life cycle.

ANNEX I Results of the LCA for the format with MAXIMUM environmental impact

IMPACT CATEGORY	PARAMETER	UNIT	LIFE CYCLE STAGES										
			PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
			A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Global warming	Global warming potential	kg CO_2 equiv	12,4	1,4	5,6E-01	N.R	1,5E-01	N.R	N.R	1,9E-01	0	1,7E-01	-1,7E-01
Ozone depletion	Ozone depletion potential	kg CFC-11 equiv	8,4E-07	2,8E-09	9,6E-09	N.R	5,4E-08	N.R	N.R	3,9E-10	0	1,5E-09	-1,9E-08
Acidification for soil and water	Acidification potential of soil and water	kg SO_2 equiv	4,2E-02	1,3E-02	5,1E-04	N.R	9,1E-04	N.R	N.R	9,9E-04	0	6,3E-04	8,0E-05
Eutrophication	Eutrophication potential	kg $(PO_4)^{3-}$ equiv	4,6E-03	1,9E-03	2,4E-04	N.R	1,6E-04	N.R	N.R	2,0E-04	0	9,2E-05	-3,8E-05
Photochemical ozone formation	Photochemical ozone formation potential	kg Ethene equiv	3,4E-03	1,0E-03	6,0E-05	N.R	2,6E-04	N.R	N.R	1,1E-04	0	1,1E-04	-4,6E-06
Depletion of abiotic resources - elements	Abiotic depletion potential for non fossil resources	kg Sb equiv	2,3E-05	3,3E-08	6,6E-05	N.R	2,2E-07	N.R	N.R	4,6E-09	0	1,1E-09	5,6E-09
Depletion of abiotic resources – fossil fuels	Abiotic depletion potential for fossil resources	MJ, valor calorífico neto	160,1	19,2	4,1	N.R	1,3	N.R	N.R	2,7	0	1,2	-1,5

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table I.1. Parameters describing environmental impacts for porcerlanic tiles (BIa) *[values for the format with higher impact]*

PARAMETER	UNIT	LIFE CYCLE STAGES										
		PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	22,3	3,5E-02	5,7E-02		2,1			5,0E-03	0	9,1E-02	3,6E-01
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0		0			0	0	0	0
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	22,3	3,5E-02	5,7E-02		2,1			5,0E-03	0	9,1E-02	3,6E-01
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ, net calorific value	232,7	19,5	5,2		2,0			2,7	0	1,4	-2,0
Use of non renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
Total use of non renewable primary energy resources	MJ, net calorific value	232,7	19,5	5,2		2,0			2,7	0	1,4	-2,0
Use of secondary material	kg	0	0	0		0			0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0		0			0	0	0	0
Use of non renewable secondary fuels	MJ, net calorific value	0	0	0		0			0	0	0	0
Net use of fresh water	m^3	7,6E-02	5,4E-04	1,1E-03		3,0E-01			7,9E-05	0	2,2E-03	-1,9E-02

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table I.2. Parameters describing use of resources for porcelain tiles (BIa) [values for the format with higher impact]

PARAMETER	UNIT	LIFE CYCLE STAGES										
		PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2,8E-02	0	3,0E-03	N.R.	1,8E-05	N.R.	N.R.	0	0	0	1,1E-04
Non hazardous waste disposed	kg	95,7	6,1E-02	7,2E-01		2,4E-02			8,7E-03	0	17,0	8,2
Radioactive waste disposed	kg	9,5E-03	3,5E-05	1,3E-04		3,7E-06			4,9E-06	0	0	2,4E-04

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table I.3. Parameters describing waste categories for porcelain tiles (BIa) [values for the format with higher impact]

PARAMETER	UNIT	LIFE CYCLE STAGES										
		PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Components for re-use	kg	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
Materials for recycling	kg	0	0	2,0E-01		0			0	19,6	0	-1,6E-02
Materials for energy recovery	kg	0	0	6,8E-02		0			0	0	0	0
Exported energy	MJ per energy carrier	0	0	0		0			0	0	0	0

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table I.4. Parameters describing other output flows for porcelain tiles (BIa) [values for the format with higher impact]

ANNEX II Results of the LCA for the format with MINIMUM environmental impact

IMPACT CATEGORY	PARAMETER	UNIT	LIFE CYCLE STAGES										
			PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
			A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Global warming	Global warming potential	kg CO_2 equiv	9,9	1,2	5,5E-01	N.R	1,5E-01	N.R.	N.R.	1,7E-01	0	1,4E-01	-1,5E-01
Ozone depletion	Ozone depletion potential	kg CFC-11 equiv	6,6E-07	2,3E-09	9,6E-09	N.R	5,4E-08	N.R.	N.R.	3,4E-10	0	1,3E-09	-1,7E-08
Acidification for soil and water	Acidification potential of soil and water	kg SO_2 equiv	3,4E-02	1,1E-02	5,1E-04	N.R	9,1E-04	N.R.	N.R.	8,5E-04	0	5,4E-04	6,7E-05
Eutrophication	Eutrophication potential	kg $(PO_4)^{3-}$ equiv	3,8E-03	1,6E-03	2,4E-04	N.R	1,6E-04	N.R.	N.R.	1,7E-04	0	7,9E-05	-3,3E-05
Photochemical ozone formation	Photochemical ozone formation potential	kg Ethene equiv	2,7E-03	8,7E-04	6,0E-05	N.R	2,6E-04	N.R.	N.R.	9,4E-05	0	9,5E-05	-4,9E-06
Depletion of abiotic resources - elements	Abiotic depletion potential for non fossil resources	kg Sb equiv	1,6E-05	2,7E-08	6,6E-05	N.R	2,2E-07	N.R.	N.R.	3,9E-09	0	9,2E-10	4,3E-09
Depletion of abiotic resources – fossil fuels	Abiotic depletion potential for fossil resources	MJ, net calorific value	127,1	16,0	4,1	N.R	1,3	N.R.	N.R.	2,3	0	1,1	-1,3

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table II.1. Parameters describing environmental impacts for porcerlanic tiles *(BIa) [*values for the format with lower impact*]*

PARAMETER	UNIT	LIFE CYCLE STAGES										
		PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	18,1	2,9E-02	5,7E-02		2,1			4,3E-03	0	7,8E-02	3,2E-01
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0		0			0	0	0	0
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	18,1	2,9E-02	5,7E-02		2,1			4,3E-03	0	7,8E-02	3,2E-01
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ, net calorific value	184,6	16,3	5,2		2,0			2,3	0	1,2	-1,8
Use of non renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
Total use of non renewable primary energy resources	MJ, net calorific value	184,6	16,3	5,2		2,0			2,3	0	1,2	-1,8
Use of secondary material	kg	0	0	0		0			0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0		0			0	0	0	0
Use of non renewable secondary fuels	MJ, net calorific value	0	0	0		0			0	0	0	0
Net use of fresh water	m^3	5,6E-02	4,5E-04	1,1E-03		3,0E-01			6,8E-05	0	1,9E-03	-1,6E-02

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table II.2. Parameters describing use of resources for porcelain tiles (BIa) [values for the format with lower impact]

PARAMETER	UNIT	LIFE CYCLE STAGES										
		PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2,1E-02	0	3,0E-03	N.R.	1,8E-05	N.R.	N.R.	0	0	0	1,0E-04
Non hazardous waste disposed	kg	65,3	5,1E-02	7,2E-01		2,4E-02			7,5E-03	0	14,5	7,0
Radioactive waste disposed	kg	7,5E-03	2,9E-05	1,3E-04		3,7E-06			4,2E-06	0	0	2,1E-04

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table II.3. Parameters describing waste categories for porcelain tiles *(BIa) [values for the format with lower impact]*

PARAMETER	UNIT	LIFE CYCLE STAGES										
		PRODUCT STAGE	CONSTRUCTION PROCESS		USE			END OF LIFE				BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1 - A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
Components for re-use	kg	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
Materials for recycling	kg	0	0	2,0E-01		0			0	16,8	0	-1,6E-02
Materials for energy recovery	kg	0	0	6,8E-02		0			0	0	0	0
Exported energy	MJ per energy carrier	0	0	0		0			0	0	0	0

A1. Raw materials supply
A2. Transport
A3. Production
A4. Transport
A5. Construction/installation process

B1. Use
B2. Maintenance
B3. Repair
B4. Replacement

B5. Refurbishment
B6. Operational energy use
B7. Operational water use

C1. Deconstruction
C2. Transport
C3. Waste processing
C4. Disposal

D. Reuse, recovery and recycling potential

N.R.: Not relevant

Table II.4. Parameters describing other output flows for porcelain tiles *(BIa) [values for the format with lower impact]*

Porcelánicos
HDC