EPD

CERTIFICATION

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GlobalEPD
A VERIFIED ENVIRONMENTAL DECLARATION

Environmental Product Declaration

UNE-EN ISO 14025:2010
UNE-EN 15804:2012+A1:2014

PERONDA GROUP

AENOR

Porcelain tiles
(classified as group BIa in accordance with UNE-EN 14411: 2016)

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PERONDA GROUP, S.A

The titleholder of this declaration is responsible for its contents and for keeping supporting documents during the period of validity that confirm the information and statements that it contains.

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AENOR is a founder member of the ECO Platform, the European Association of Environmental Declaration Verification Agencies.

GlobalEPD-PCR-002

The European EN 15804:2012+A1:2013 standard provides the core product category rules.

Independent verification of the declaration and data, in accordance with the EN ISO 14025:2010 standard.

☐ In-house ☑ External

Verification agency

AENOR

1 General Information

1.1. The organization

Peronda Group has a long solid business history, with origins documented as dating back to the early 19th century. Indeed, in 1827, the Peris and Martí families worked as potters in the town of Onda in the Spanish province of Castellón.

Due to this extensive experience of the trade spanning over a century, in 1951 the company Peris y Cia was founded, with a factory in the middle of the town of Onda.

In the 1960s, the company was already demonstrating its pioneering spirit and flair for the export trade, and a significant percentage of its products were sold in markets as far away as Australia.

1969 was a landmark in the history of the company for two important reasons: the company moved to its current premises and the Peronda brand name was created–a brand that now acts as a worldwide banner for the company. Since then, the company has continued to re-invest in all its processes, with the steady incorporation of new cutting-edge technologies.

Peronda Group was one of the first factories to introduce the single-fired porous tile manufacturing system and it also pioneered large-format ceramic tiles.

All this has allowed the company to grow in a sustainable rational way, and it has forged a solid competitive reputation in domestic and foreign markets, with shareholdings in several different companies.
Peronda currently has factory premises covering a surface area of 300,000 m2, including covered areas amounting to 130,000 m2. The company has a logistics centre and two production plants that produce 30,000 m2 of wall and floor tiles per day.

Its competitive production facilities are the outcome of ongoing reinvestment policies in R&D and innovation, with special attention to efficient customer service and ongoing innovations in the design and manufacture of its wall and floor tiles, based at all times on the application of sustainable eco-friendly manufacturing processes.

In recent years, Peronda has invested heavily in the extension of its second production centre, doubling its manufacturing capacity. Over the same period, two new press and glazing lines have been introduced, equipped with digital printing systems, in addition to investment into a new kiln, the extension of its sorting lines, and the incorporation of new polishing, rectifying, cutting and round-edging lines.

1.2. Scope of the declaration

This Environmental Product Declaration contains environmental information about a group of products made by the same manufacturer, PERONDA, in 2017 in a Spanish geographical and technological context.
The results show the environmental performance of an average porcelain tile, weighted by production, in addition to environmental data for the tiles recorded as having the highest and lowest environment impact in order to delimit the outcome of the lifecycle analysis. This is a cradle-to-grave Environmental Product Declaration (henceforth EPD).

1.3. Lifecycle and conformity

This EPD has been drafted and verified in accordance with the UNE-EN ISO 14025:2010 and UNE-EN 15804:2012+A1:2014 standards and the following category rules:

Title	Tile coverings
Registration no. & version	002 rev.1
Conformity	UNE-EN 15804:2012+A1:2014
Programme operator	AENOR

Table 1. PCR data

This EPD might not be comparable with those drafted in accordance with other programmes and it might not comply with other reference documents. More specifically, it might not be comparable with an EDP that has not been drawn up in accordance with the UNE-EN 15804 standard. Similarly, EDPs might not be comparable if the source of the data is different (e.g. the databases), if they fail to include all the relevant information modules or if they are not based on the same scenarios. Comparisons of construction materials must be based on the same function, applying the same functional unit and comparing them at a building (or architectural or engineering) level: that is, covering the product performance across the whole lifecycle and including the specifications outlined in section 6.7.2. of the UNE-EN ISO 14025 standard.

2 The product

2.1. Product identification

The ceramic tiles cited in this study are rated as having a BIa (porcelain tile) water absorption rate, a classification based on the UNE-EN 14411: 2016 standard (equivalent to the ISO 13006:2018 standard). That is, they have a water absorption rate of less than 0.5%. These tiles are commonly known as porcelain tiles.
The porcelain tiles in this study encompass different models and different formats. More specifically, the formats that this EDP covers have a thickness ranging from 7.8 mm to 12 mm, with an average weight of 23.0 kg/m2.

The annexes show the results of the formats covered by this EPD with the highest and lowest environmental impacts. That is, the 23x180cm format, with a 26.6 kg/m2 fired weight, and the 45.6x45.6cm format with an 18.1 kg/m2 fired weight, respectively.

2.2. Product performance

This product is designed to act as a surface covering. This study assessed the environmental performance of the porcelain tiles when used as floor coverings in homes, although thanks to their versatility, they can be used elsewhere, in places like offices, shops or hospitals, both indoors and out. Likewise, they can be used to clad walls and other surfaces.
The following table shows the technical properties of all the ceramic tiles in accordance with the requirements of the UNE-EN 14411:2016 standard.

Figure 2. The tiles when laid.

PERFORMANCE CHARACTERISTIC	TEST METHOD	UNITS
Length (deviation W)	Continuous testing during sorting Tolerances depending on type of product.	mm
Thickness (deviation W)		
Straightness of sides		
Squareness		
Central curvature		
Edge curvature		
Warpage		
Water absorption	Internal test as per ISO 10545-3. Yearly external test for each water absorption group.	%
Breaking strength (e≥7.5mm)	Internal test as per ISO 10545-4. Yearly external test for each water absorption group.	N - N/mm 2
Breaking strength (e<7.5mm)		
Slip resistance	CEN/TS 16165	
Fire performance (without mesh)	EN 13501-I	
Fire performance (with mesh)		
Impact resistance	Internal test as per ISO 10545-4. Yearly external test for each water absorption group.	Resistant
Deep abrasion	External test for UGL finishes as per ISO 10545-6.	Mm3
Thermal expansion	External test for each water absorption group as per ISO 10545-8	1/ºC
Thermal shocks	Internal test as per ISO 10545-9. Yearly external test for each water absorption group.	Resistant
Crazing	Internal test as per ISO 10545-11. Yearly external test for each water absorption group.	Resistant
Frost & ice	External test for each water absorption group as per ISO 10545-12	
Resistance to acids and alkalis (low concentration)	Internal test as per ISO 10545-13. Yearly external test for each water absorption group.	A/B/C
Resistance to acids and alkalis (high concentration)	Internal test as per ISO 10545-13. Yearly external test for each water absorption group.	A/B/C
Household products & swimming pools		
Stain resistance (unglazed)	Internal test as per ISO 10545-14. Yearly external test for each water absorption group.	1-5
Pb & Cd release	At the client's request.	
Small colour differences		
Slip resistance	Internal slip resistance test as per ENV 12633 and BS 7976. External tests as per DIN 51130, DIN 51092 and COF/DCOF	

Table 1. Product Performance

2.3. Product composition

None of the end product's components are included in the Candidate List of Substances of Very High Concern (SVHC) for Authorization.

Substance	Contents	Units
Clay, feldspars, sands, & deflocculants	97%	Kg/m2
Feldspars, carbonates, quartz, silicates, kaolin, zirconium oxides, clay, alumina, zinc oxide	3%	Kg/m2

Table 2. Main product components

3 Information regarding the LCA

3.1. LCA

The Lifecycle Analysis (LCA) on which this EPD is based was conducted using data supplied directly by the manufacturer, PERONDA, relating to its tile coverings in 2017, manufactured at two different production centres.

The said LCA was conducted in accordance with the ISO 14040 and ISO 14044 standards and with revised version 1 of the GlobalEPD RCP-002 tile covering document from the GlobalEPD Programme run by AENOR, which complies with the UNE EN 15804:2012+A1:2014 standard.

The results of the ceramic tiles with the highest and lowest environmental impacts (the 23x180cm format, with a fired weight of 26.6 kg/m2, and the 45.6x45.6cm format, with a fired weight of 18.1 kg/m2, respectively) are shown in Annexes I and II. The LCA was conducted using the GaBi 8.7.0.18 software programme and the 8.007 (Thinkstep) version of the database.

The characterization factors are those included in the UNE EN 15804:2012+A1:2014 standard.

3.2. Functional or declared unit

The Functional Unit that was taken is a "1m2 surface clad with porcelain tiles for 50 years."

3.3. Reference service life (RSL)

The product's reference service life is the same as that of the building where it is laid, provided that it has been properly laid, given that this is a long-lasting product that does not need replacing. A service life of 50 years was taken.

Parameter	Result (expressed for functional unit)
Reference service life	Minimum 50 years
Declared product properties (at gate), finishes, etc.	Minimum values of the relevant characteristics as per Appendix G of the UNE-EN 14411. standard. For further information, ask for a copy of the relevant model's technical data sheet.
Design application parameters (manufacturer's instructions), including references to appropriate practices.	For further information, ask for a copy of the relevant model's technical data sheet.
Assumed quality of work, when laid in accordance with the manufacturer's instructions	
Outdoor environment (for outdoor applications), e.g. weathering, pollutants, UV radiation and wind exposure, building orientation, shading and temperature.	Resulting values of the relevant characteristics as per Appendix G of the UNE-EN 14411 standard. For further information, ask for a copy of the relevant model's technical data sheet.
Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure.	
Usage conditions, e.g. frequency of use, mechanical exposure.	For further information, ask for a copy of the the relevant model's technical data sheet.
Maintenance, e.g. required frequency, type and quality and replacement of replaceable components.	

Table 3. Reference Service Life

3.4. Allocation & cut-off criteria

- In this cradle-to-grave LCA, a 1% cut-off criterion was applied for energy use (renewable and non-renewable) and 1% of the total mass in unit processes with insufficient data. In total, over 95% of all the inputs and outputs of the system's materials and energy were included, except for data that was either not available or had not been quantified.

- The excluded data comprises:

- Atmospheric emissions of diffuse particles, generated during the transportation and storage of powdery raw materials.

- Unlegislated channelled atmospheric emissions generated during combustion stages (spray-drying, drying and firing of tiles).

- The recycling and re-use of waste generated throughout the lifecycle of the ceramic tiles, based on the PCR, although the waste recycling process and related benefits are accounted for in Module D.

- The manufacture of machinery and industrial equipment, due to the complexity of compiling an inventory of all the involved goods and also because the LCA community believes that the environmental impact per unit of product is low in relation to the other processes that are included. Moreover, the databases that are used do not include these processes and so their inclusion would require additional efforts beyond the scope of this analysis. Similarly, waste generated during the maintenance of the said machinery and equipment is excluded, due to its low impact.

3.5. Representativeness, quality and selection of the data

The primary data was supplied directly by PERONDA. This information corresponds to the two production plants that it owns. The secondary data was taken from the 8007 GaBi databases, modelled using version GaBi 8.0.7.18. All the data refers to 2017, to a Spanish geographical scenario.

The outlined results are representative of an average group BIa ceramic tile, weighted by production and delimited on either side by the products with the highest and lowest environmental impacts.

3.6. Other calculations, rules and hypotheses

The necessary loads were applied to quantify the specific data for the porcelain tiles and to make the necessary calculations to record the data for the products with the highest and lowest environmental impacts.

4 System boundaries, scenarios and additional technical information

All the relevant product stage modules for ceramic tiles were included, as per the PCR.

As for the raw materials for the glazes, the ones most commonly used in their formulae are quartz, kaolin, alkali feldspars, nepheline, calcium carbonate, dolomite, zircon, wollastonite, calcined alumina and ceramic frits. Specially prepared ceramic pigments are also

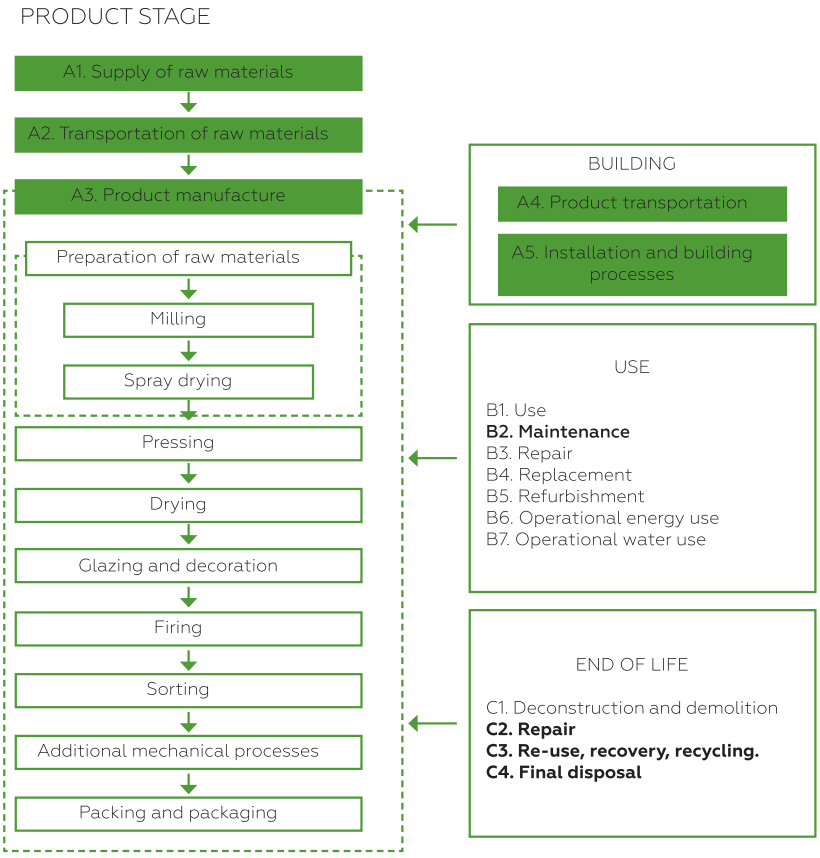

Figure 4. Product stage

used, generally through the calcination of oxides and the use of additives (suspending agents, deflocculants, binders) to ensure a suspension with optimum rheological properties so as to facilitate the glazing process and achieve the required appearance (texture, uniform colour).

Ceramic frits are insoluble glasses made by fusing raw materials known as "frits". On average, it has been estimated that about 30% of the raw materials used in the porcelain tile glazes are subjected to fritting processes.

The raw materials are sourced from different places, depending on their properties and type. Raw materials sourced abroad are shipped by freighter to the port of Castellón and then delivered by truck to the production plants. For the shipping stage, a type of transoceanic cargo ship was taken that covers varying distances depending on the port of origin. For road travel, a 27-ton truck was chosen compliant with the Euro 6 standard. All the raw materials are supplied in bulk and so no packaging is required, except for the decorative materials, which are delivered in a 17.3-ton truck compliant with the Euro 6 standard from the frit and glaze factory direct to PERONDA's plant. A distance of 21 km was taken for the LCA.

4.1. Upstream processes

Raw materials (A1 and A2)
The raw materials needed to make the ceramic tiles are classified as: plastic raw materials and aplastic or tempering raw materials. More specifically, the plastic materials included in the composition of the tile body consist of clays, feldspars and sands, in addition to waste from the production process, such as slurries and unfired or fired waste clay which is incorporated in the raw material milling stage.

4.2. Product manufacture

Manufacture (A3)

The raw materials for PERONDA are prepared by a spray dried powder supplier. During this process, the precise proportion of raw materials is defined to meet the needs of the production process and required end performance.

The spray-dried powder is obtained by wet-milling the raw materials and then spray-drying them. PERONDA's supplier has cogeneration heat and power supply systems in its spray driers. All the hot gases are used for the spray-drying process and the electricity that is generated is partly used in the production process, thus reducing its mains electricity consumption, and part is sold to the grid

Once the spray-dried powder has been produced, it is delivered to the pressing plant. This process and other subsequent ones are carried out at the same PERONDA production plant. The procedure is as follows. The spray-dried powder is unloaded and stored in hoppers. Then, using a feeder system and conveyor belts with a weight control system, it is carried to the pressing section to be dry-pressed in uniaxial hydraulic presses. This is the best method for controlling the pressing cycle and for making large-format tiles.

The pressed tiles are put in a continuous dryer to reduce their moisture content. This doubles or triples their mechanical resistance so that they can go on to be processed.

When the tiles come out of the dryer, they are covered in a thin layer or several layers of engobe and glaze, applied directly to the tile body by using surface spray and digital-glazing techniques. Then they are decorated, using different methods. These mainly comprise digital printing with inks and, to a lesser extent, the use of crushed frits and photogravure. This gives the surface of the fired tiles a series of technical and visual properties: an easy-to-clean surface, imperviousness, glossy shine, colour, surface texture and chemical and mechanical resistance.

Firing is the most important stage in the tile production process, because it is the point when the properties of the pressed tiles undergo a fundamental change and they acquire a hardness and resistance to water and chemicals. The tiles are single-fired i n single-layer roller kilns.

In the search for new tile effects, a whole new series of additional processes have been developed for the fired tiles: cutting, surface polishing, rectifying etc.

After undergoing the necessary quality controls, the sorted tiles are packaged in cardboard and then stacked onto wooden pallets covered in plastic film.

4.3. Construction process

Product transportation (A4)

28% of the tiles are distributed throughout Spain, 39% throughout the rest of Europe, and the remaining 33% throughout the rest of the world.

In the case of road transport, the estimations are based on a 27-ton truck compliant with the Euro 6 standard and, in the case of intercontinental transport, an average transoceanic cargo ship was taken.

TECHNICAL INFORMATION.
Stage of the construction process. Delivery to the worksite.

Parameter	Result (expressed for functional unit)
Fuel type and consumption	0.29 litres diesel Fuel type and consumption (Euro 6 27-ton truck) 0.0005 litres fuel oil (cargo ship)
Distance	300 km Spanish distribution: 28% 1390 km distribution rest of Europe: 39% 6520 km distribution rest of world: 33%
Capacity utilization (including empty returns)	85% of truck 100% of cargo ship
Bulk density of transported products	415.38 kg/m3
Volume capacity utilization factor (factor: =1 or < 1 or ≥ 1 for compressed or nested packaged products)	0.18

Table 4. Transport to building site

Product installation and construction process (A5)

Once the packaging has been removed, the product is then laid. In accordance with the obtained data and in order to use a realistic scenario, it was decided that a quick-drying mortar would be used to lay the tiles.

Cement-based adhesive mortars are cementitious adhesives made of a combination of hydraulic binders, mineral fillers and organic additives which just need mixing with water or another liquid prior to use. They are made up of a mix of white or grey cement, silica-based and/or limestone mineral fillers and organic additives (water retainers, water-redispersible polymers, rheology modifiers, fibres etc.).

The waste packaging from the tiles is separately sorted, depending on the geographical location of the site where the product is laid.

TECHNICAL INFORMATION. Stage of the construction process. Installation in building	
Parameter	**Result (expressed for functional unit)**
Material 1: Cementitious adhesive	3.5 kg
Use of water	0.00088 m3
Use of other resources	Not applicable
Quantitative description of energy type (regional mix) and consumption during installation process	Not applicable
Wastage of materials on the construction site before waste processing, generated by the product's installation (specified by type)	Waste packaging: Cardboard: 0.12 kg Plastic film: 0.01 kg Strapping: 0.01 Wood: 0.22 kg
Output materials (specified by type) as a result of waste processing at the construction site	Incinerated cardboard: 0.008kg Recycled cardboard: 0.088 kg Landfill disposal of cardboard: 0.023 kg Incinerated plastic: 0.0024 kg Recycled plastic:0.0133 kg Landfill disposal of plastic: 0.0055 kg Incinerated wood: 0.027 kg Recycled wood: 0.266 kg Landfill disposal of wood: 0.074 kg
Direct emissions to ambient air, soil and water	Not applicable

Table 5. Installation of product in the building

4.4. Use related to the building fabric

Use (B1)

Once they have been laid, the tiles do not require any energy input for their use or any maintenance, except for normal cleaning. As a result, of all the aforementioned modules, only environmental loads attributable to the product's maintenance have been considered (module B2).
In accordance with PERONDA, the reference service life is the same as that of the building where the tiles are laid, provided that they have been properly laid, since this is a long-lasting product that does not need replacing. A service life of 50 years was taken for the purpose of estimations.

Maintenance (B2)

The product can be cleaned with a damp cloth. If there is dirt or grease on the surface, a cleaning agent such as a detergent or bleach can be added. In this study, the estimated consumption of water and disinfectant is based on a tiled floor used for residential purposes; that is, a floor cleaned with water once a week and with water and a detergent every two weeks for the 50 years of its service life.

TECHNICAL INFORMATION. Use related to the building fabric

Parameter	Result (expressed for functional unit)
B2 MAINTENANCE	
Maintenance process	Cleaned once a week with water and every two weeks with detergent (residential use).
Maintenance cycle	Not applicable
Ancillary materials for maintenance (e.g. cleaning agent) (specifying each material)	Detergent: 1.34E-04 kg per clean
Wastage of materials during maintenance (specifying each type)	Not applicable
Net fresh water consumption	0.1 litre per clean
Energy input during maintenance (e.g. vacuum cleaning), energy carrier type (e.g. electricity) and amount, if applicable and relevant	Not applicable

Table 6. Use related to the building fabric

4.5. Use related to the operation of the building

B3 REPAIR	
Repair process	Not applicable
Inspection process	
Repair cycle	
Ancillary materials (e.g. lubricant) (specifying each material)	
Wastage of materials during repair (specifying each material)	
Net fresh water consumption	
Energy input during repair (e.g. for use of cranes), energy carrier type (e.g. electricity) and amount	
B4 REPLACEMENT	
Replacement cycle	Not applicable
Energy input during replacement (e.g. for use of cranes), energy carrier type	
(e.g. electricity) and amount, if applicable and relevant	
Replacement of worn parts during the product lifecycle (e.g. zinc-coated steel sheets), specifying each material.	
B5 REFURBISHMENT	
Refurbishment process	Not applicable
Refurbishment cycle	
Energy input during refurbishment (e.g. for use of cranes),	
energy carrier type (e.g. electricity) and amount, if applicable and relevant.	
Material input for refurbishment (e.g. bricks), including ancillary materials for the refurbishment process (e.g. lubricant) (specify materials).	
Wastage of materials during refurbishment (specify materials)	
Other assumptions for scenario development (e.g. frequency and time period of use, number of occupants).	

Table 7. Use of energy and water related to the operation of the building

4.6. Use related to the operation of the building

The ceramic tile coverings do not require any energy or water input for their use.

Parameter	
Ancillary materials (specified by material)	Not applicable
Net fresh water consumption	
Type of energy carrier, e.g. electricity, natural gas, district heating	
Power output of equipment	
Characteristic performance (e.g. energy efficiency, emissions, variation of performance with capacity utilization etc.)	
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants)	

Table 8. Use of energy and water related to the operation of the building

4.7. End of life

De-construction and demolition (C1)

Once its service life is over, the product will be removed, either through the refurbishment or demolition of the building. If it is demolished, the impacts of the product's removal are negligible.

Transport (C2)

The waste materials from the product are taken by a Euro-6-compliant truck a distance of 50 km to their destination.

Waste processing for re-use, recovery and recycling (C3)

Based on the distribution of the tiles (A5) and the latest statistical data (Eurostat, 2016), 70% of the building and demolition waste is sent for re-use, recovery or recycling.

Final disposal (C4)

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

TECHNICAL INFORMATION. End of life

Parameter	Result (expressed for functional unit)
Collection process, specified by type	23.0 kg (tile) + 3.5kg (bonding material)
Recovery system, specified by type	18.6 kg recycled as filler material
Disposal, specified by type	8.0 kg to controlled landfill
Further assumptions for scenario development (e.g. transport)	The waste materials from the product are transported in a 24-ton heavy goods vehicle compliant with the Euro 6 standard. A distance of 50 km has been taken for the purpose of estimations, both to the end disposal point and to the recycling plant. This also includes the return journey by the truck (100% empty returns).

Table 9. End of life

4.8. Benefits and loads beyond the system boundary

Module D Potential benefits and environmental loads derived from re-use, recovery and recycling activities.

Loads are assumed to be avoided during manufacturing (waste like cardboard, plastic and wood), during the installation process (waste packaging: cardboard, plastic and wood) and at the end of the product's life.

5 Declaration of the environmental parameters of the LCA and LCI

Environmental impacts

	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP	kg CO2 eq	11.6	7.4E-01	1.0		3.3E-01			1.4E-01	0	9.0E-02	-2.9E-01
ODP	kg CFC11 eq	6.2E-08	2.0E-14	5.2E-13		1.6E-07			3.9E-15	0	9.2E-14	-3.5E-09
AP	kg SO2 eq	2.3E-02	6.2E-04	1.6E-03		1.8E-03			1.1E-04	0	5.3E-04	-9.0E-04
EP	kg (PO4)3- eq	3.5E-03	1.4E-04	3.1E-04	N.R.	4.6E-04	N.R.	N.R.	2.5E-05	0	7.3E-05	-1.2E-04
POCP	kg ethylene eq	2.0E-03	8.4E-05	1.3E-04		5.7E-04			1.6E-05	0	4.2E-05	-8.8E-05
ADPE	kg Sb eq	7.8E-06	6.1E-08	1.5E-06		4.6E-07			1.2E-08	0	3.2E-08	-5.4E-08
ADFP	MJ	182.6	10.0	4.9		1.7			1.9	0	1.2	-5.7

GWP	[kg CO2 eq]	Global warming potential
ODP	[kg CFC-11 eq]	Depletion potential of stratospheric ozone layer
AP	[kg SO2 eq]	Acidification potential of soil and water
EP	[kg (PO4)3- eq]	Eutrophication potential
POCP	[kg ethylene eq]	Formation potential of tropospheric zone
ADPE	[kg Sb eq]	Abiotic depletion potential for non-fossil resources (ADP-elements)
ADPF	[MJ]	Abiotic depletion potential for fossil resources (ADP-fossil fuels)

Table 10. Parameters describing environmental impacts

Resource use

Parameter		Units	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
	PERE	MJ	27.8	5.5E-01	1.2		6.3			1.1E-01	0	1.4E-01	-1.4
	PERM	MJ	0	0	0		0			0	0	0	0
	PERT	MJ	27.8	5.5E-01	1.2		6.3			1.1E-01	0	1.4E-01	-1.4
	PENRE	MJ	196.4	10.1	5.6		2.0			1.9	0	1.2	-6.1
	PENRM	MJ	0	0	0		0			0	0	0	0
	PENRT	MJ	196.4	10.1	5.6		2.0			1.9	0	1.2	-6.1
	SM	MJ	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
	RSF	MJ	0	0	0		0			0	0	0	0
	NRSF	MJ	0	0	0		0			0	0	0	0
	FW	m3	4.8	4.4E-02	4.3E-01		2.6E-01			8.4E-03	0	6.7E-02	-5.5E-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 materials
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

Output flows and waste categories

		Unit	A1-A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
	HWD	kg	4.5E-02	0	0	N.R.	0	N.R.	N.R.	0	0	0	5.0E-04
	NHWD	kg	83.1	3.6E-02	1.5		1.9E-01			7.0E-03	0	11.4	-7.8
	RWD	kg	4.8E-03	1.4E-05	2.5E-04		2.0E-05			2.7E-06	0	1.7E-05	3.3E-05
	CRU	kg	0	0	0		0			0	0	0	0
	MFR	kg	0	0	2.1E-01		0			0	18.7	0	-9.9E-03
	MER	kg	0	0	0		0			0	0	0	0
	EE	MJ	0	0	0		0			0	0	0	0
	EET	0	0	0	0		0			0	0	0	0

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

Table 12. Parameters describing other output flows

N.B.: The radioactive waste shown in the above table is mainly from the electricity used in manufacturing processes or from the obtainment of raw materials and their transportation, and so it is not generated on the manufacturer's premises.

6 Additional Environmental Information

Indoor air emissions

During the manufacturing process, the ceramic tiles are subjected to temperatures of over 1000ºC. At such temperatures, any organic compound in the composition of the tiles decomposes, leading to an inert end product with no volatile organic compounds that might be released during the tiles' use.

Release to soil and water

Ceramic tiles do not release any compounds into the soil or water during their use, since they are totally inert products that do not undergo any physical, chemical or biological changes. They are not soluble or combustible and neither do they react physically, chemically or in any other way. They are not biodegradable and they do not have a negative effect on other materials with which they are in contact in such a way that they might give rise to environmental pollution or be detrimental to human health. They are non-leaching and so they do not constitute a hazard for the quality of ground or surface water.

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ANNEX I LCA results for the format with the LOWEST ENVIRONMENTAL IMPACT:

	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
	kg CO2 eq	7.7	6.2E-01	8.4E-01	N.R.	2.8E-01	N.R.	N.R.	1.2E-01	0	7.6E-02	-2.5E-01
	kg CFC11 eq	4.6E-08	1.7E-14	4.4E-13		1.3E-07			3.3E-15	0	7.7E-14	-2.9E-09
	kg SO2 eq	1.9E-02	5.2E-04	1.3E-03		1.5E-03			9.1E-05	0	4.5E-04	-7.6E-04
	kg (PO4)3- eq	3.0E-03	1.1E-04	2.6E-04		3.8E-04			2.1E-05	0	6.1E-05	-1.0E-04
	kg ethylene eq	1.5E-03	7.1E-05	1.1E-04		4.8E-04			1.3E-05	0	3.5E-05	-7.4E-05
	kg Sb eq	5.4E-06	5.1E-08	1.2E-06		3.8E-07			9.8E-09	0	2.7E-08	-4.5E-08
	MJ	122.3	8.4	4.1		1.5			1.6	0	9.8E-01	-4.8

GWP	[kg CO2 eq]	Global warming potential
ODP	[kg CFC-11 eq]	Depletion potential of stratospheric ozone layer
AP	[kg SO2 eq]	Acidification potential of soil and water
EP	[kg (PO4)3- eq]	Eutrophication potential
POCP	[kg ethylene eq]	Formation potential of tropospheric zone
ADPE	[kg Sb eq]	Abiotic depletion potential for non-fossil resources (ADP-elements)
ADPF	[MJ]	Abiotic depletion potential for fossil resources (ADP-fossil fuels)

Table I.1. Impact indicators

Parameter	Units	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PERE	MJ	16.1	4.7E-01	1.0		5.3			9.0E-02	0	1.2E-01	-1.1
PERM	MJ	0	0	0		0			0	0	0	0
PERT	MJ	16.2	4.7E-01	1.0		5.3			9.0E-02	0	1.2E-01	-1.1
PENRE	MJ	129.8	8.5	4.7		1.6			1.6	0	1.0	-5.1
PENRM	MJ	0	0	0		0			0	0	0	0
PENRT	MJ	129.8	8.5	4.7		1.6			1.6	0	1.0	-5.1
SM	MJ	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
RSF	MJ	0	0	0		0			0	0	0	0
NRSF	MJ	0	0	0		0			0	0	0	0
FW	m3	3.3	3.7E-02	3.6E-01		2.2E-01			7.1E-03	0	5.6E-02	-4.6E-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 materials
RSF [MJ] Use of renewable secondary fuels
NRSF [MJ] Use of non-renewable secondary fuels
FW [m3] Net use of fresh water

Table I.2. Parameters describing resource use

		Unit	A1-A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
	HWD	kg	1.6E-02	0	0		0			0	0	0	4.2E-04
	NHWD	kg	58.0	3.1E-02	1.3		1.6E-01			5.9E-03	0	9.6	-6.6
	RWD	kg	2.4E-03	1.2E-05	2.1E-04		1.7E-05			2,. E-06	0	1.4E-05	2.8E-05
	CRU	kg	0	0	0	N.R.	0	N.R.	N.R.	0	0	0	0
	MFR	kg	0	0	1.8E-01		0			0	15.7	0	-7.3E-03
	MER	kg	0	0	0		0			0	0	0	0
	EE	MJ	0	0	0		0			0	0	0	0
	EET	0	0	0	0		0			0	0	0	0

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

Table I.3. Parameters describing output flows and waste categories

N.B.: The radioactive waste shown in the above table is mainly from the electricity used in manufacturing processes or from the obtainment of raw materials and their transportation, and so it is not generated on the manufacturer's premises.

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ANNEX II Declaration of the environmental parameters of the LCA and LCI for the format with the HIGHEST environmental impact

	Unit	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP	kg CO2 eq	13.4	8.4E-01	1.1		3.7E-01			1.6E-01	0	1.0E-01	-3.3E-01
ODP	kg CFC11 eq	6.8E-08	2.3E-14	5.9E-13		1.8E-07			4.4E-15	0	1.0E-13	-4.0E-09
AP	kg SO2 eq	2.6E-02	7.0E-04	1.8E-03		2.0E-03			1.2E-04	0	6.0E-04	-1.0E-03
EP	kg (PO4)3- eq	3.9E-03	1.5E-04	3.5E-04	N.R.	5.2E-04	N.R.	N.R.	2.9E-05	0	8.2E-05	-1.4E-04
POCP	kg ethylene eq	2.2E-03	9.5E-05	1.5E-04		6.4E-04			1.8E-05	0	4.8E-05	-1.0E-04
ADPE	kg Sb eq	8.5E-06	6.9E-08	1.7E-06		5.2E-07			1.3E-08	0	3.7E-08	-6.1E-08
ADFP	MJ	212.9	11.4	5.6		2.0			2.2	0	1.3	-6.4

GWP	[kg CO2 eq]	Global warming potential
ODP	[kg CFC-11 eq]	Depletion potential of stratospheric ozone layer
AP	[kg SO2 eq]	Acidification potential of soil and water
EP	[kg (PO4)3- eq]	Eutrophication potential
POCP	[kg ethylene eq]	Formation potential of tropospheric zone
ADPE	[kg Sb eq]	Abiotic depletion potential for non-fossil resources (ADP-elements)
ADPF	[MJ]	Abiotic depletion potential for fossil resources (ADP-fossil fuels)

Table II.1. Parameters describing the environmental impacts defined in the UNE-EN 15804 standard

		Units	A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
	PERE	MJ	30.3	6.3E-01	1.3	N.R.	7.1	N.R.	N.R.	1.2E-01	0	1.6E-01	-1.5
	PERM	MJ	0	0	0		0			0	0	0	0
	PERT	MJ	30.3	6.3E-01	1.3		7.1			1.2E-01	0	1.6E-01	-1.5
	PENRE	MJ	228.2	11.4	6.3		2.2			2.2	0	1.4	-6.9
	PENRM	MJ	0	0	0		0			0	0	0	0
	PENRT	MJ	228.2	11.4	6.3		2.2			2.2	0	1.4	-6.9
	SM	MJ	0	0	0		0			0	0	0	0
	RSF	MJ	0	0	0		0			0	0	0	0
	NRSF	MJ	0	0	0		0			0	0	0	0
	FW	m3	5.2	5.0E-02	4.9E-01		2.9E-01			9.6E-03	0	7.6E-02	-6.2E-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 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 materials
RSF	[MJ]	Use of renewable secondary fuels
NRSF	[MJ]	Use of non-renewable secondary fuels
FW	[m3]	Net use of fresh water

Table II.2. Parameters describing resource use

		Unit	A1-A3	A4	A5	B1	B2	B3 - B7	C1	C2	C3	C4	D
	HWD	kg	5.5E-02	0	0	N.R.	0	N.R.	N.R	0	0	0	5.7E-04
	NHWD	kg	96.6	4.1E-02	1.8		2.1E-01			8.0E-03	0	12.9	-8.8
	RWD	kg	5.3E-03	1.6E-05	2.8E-04		2.3E-05			3.0E-06	0	1.9E-05	3.7E-05
	CRU	kg	0	0	0		0			0	0	0	0
	MFR	kg	0	0	2.4E-01		0			0	21.2	0	-1.2E-02
	MER	kg	0	0	0		0			0	0	0	0
	EE	MJ	0	0	0		0			0	0	0	0
	EET	0	0	0	0		0			0	0	0	0

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

Table II.3. Parameters describing output flows and waste categories

N.B.: The radioactive waste shown in the above table is mainly from the electricity used in manufacturing processes or from the obtainment of raw materials and their transportation, and so it is not generated on the manufacturer's premises.

References

[1] General rules of the GlobalEPD Programme, 2nd revised version. AENOR. February 2016

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