ENVIRONMENTAL PRODUCT DECLARATION

earthenware Tiles

(Water absorption group BIII)

DECLARATION MADE BY:

CERAMICAS APARICI

21st February, 2020

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GENERAL INFORMATION

CERAMICAS APARICI

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Castellón (Spain)

Declaration made by:

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Life Cycle Assessment made by:

Instituto de Tecnología Cerámica – (ITC-AICE). Report reference C183903,

21st February, 2020.

CERAMICAS APARICI

Ceramicas Aparici represents the very highest quality of manufacture and innovative design. The premium ceramics and porcelain of this family company act as a driving force for the developments and trends of an entire industry and are present worldwide.

The success of our manufacturing brand is based on a principle that has held good for more than fifty years, namely that our products should never be regarded as a mere building material, but as an essential part of interior and architectural design with the guarantee of their excellent qualitative and aesthetic standards.

For further information, please contact CERÁMICAS APARICI, S.L. by e-mail to info@aparici.com.

THE PRODUCT

Identification of the product in the Environmental Product Declaration

This environmental product declaration provides environmental information on the life cycle of ceramic tiles of CERAMICAS APARICI considering the geographical and technological context of Spain in the year 2017.

These tiles are manufactured by *Cerámicas Aparici* and *Azulejos y Pavimentos S.A*. located in l'Alcora and Sant Joan de Moró respectively (Castellón, Spain).

The ceramic tiles included in this study belong to water absorption group BIII, according to standard EN 14411:2016 (counterpart to standard ISO 13006:2018), that is, ceramic tiles with water absorption exceeding 10% (commonly designated earthenware tile).

The earthenware tiles included in this study includes different models with different sizes. Specifically, the product sizes considered within the scope of the study are between 6.5 mm and 10.3 mm thick and with an average weight of 16.2 kg/m^2.

Representativeness of the EPD

This Environmental Product Declaration contains environmental information about the ceramic tiles of CERAMICAS APARICI belonging to water absorption group BIII (earthenware). It contains environmental information about a group of products, so the results presented set out the average environmental performance, weighted by the production of all formats included in the scope of this document. Additionally, the Annex of this document presents the environmental data of the tiles that exhibit a minimum and a maximum impact, thus delimiting the results obtained in the Life Cycle Assessment.

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 construction products EN 15804:2012+A1:2013 and PCR documents on ceramic coverings of Spanish EPD programs have also been considered.

This Environmental Product Declaration is valid for 5 years.

This EPD may not be comparable with those developed in other Programs or under different reference documents; it may not be comparable with EPDs not prepared in accordance with the EN 15804:2012+A1:2013 standard. Similarly, EPDs may not be comparable if the origin of the data is different (e.g. databases), if not all relevant information modules are included or if they are not based on the same scenarios.

Comparison of construction products shall be done regarding the same function, using the same functional unit and building level (or architectural or engineering work), i.e. including the performance of the product throughout its life cycle and considering the specifications of section 6.7.2 of standards EN ISO 14025 and EN 15804:2012+A1:2013.

Functional Unit

The Functional Unit is *"1 m^2 covering of a (wall) surface inside a home for 50 years with earthenware tiles (group BIII)".*

Application of the product

This study evaluates the environmental performance of the use stage of the earthenware Tile as wall covering inside a home for 50 years; however, the versatility of the ceramic also allows this type of tile to be used for other purposes, e.g. in offices, shops, and hospitals, as well as for covering floors with low pedestrian traffic or other surfaces. For further information, please request the manufacturer's technical data sheet on the model involved.

Product features

The table below refers to the technical performance of earthenware manufactured in CERAMICAS APARICI:

Table 1 Product features.

Feature	Calculation or testing method		Units
Length (deviation W)	ISO 10545-2	±0.5	%
Thickness (deviation W)		±10	%
Straightness of lines		±0.3	%
Orthogonality		±0.5	%
Centre curvature		+0.5/-0.3	%
Lateral curvature		+0.5/-0.3	%
Warp curvature		±0.5	%
Superficial aspect		> 95	%
Water absorption	ISO 10545-3	E_V>10	%
Breaking strength (e≥7.5mm)	ISO 10545-4	≥ 600	N
Breaking strength (e<7.5mm)		≥ 200	N
Impact strength	ISO 10545-5	Available by product	
Deep abrasion	ISO 10545-6	-	mm^3
Thermal growth	ISO 10545-8	6.1-5.2 X 10^{-6}	1 / ºC
Thermal impact	ISO 10545-9	Meets	
Moisture expansion	ISO 10545-10	Available by product	
Cracking	ISO 10545-11	Meets	
Frost	ISO 10545-12	-	
Acid and Base Resistance (low concentration)	ISO 10545-13	Available by product	
Acid and Base Resistance (high concentration)		Available by product	
Household cleaning products and swimming pool salts		A	
Stain resistance	ISO 10545-14	5	
Pb and Cd extraction	ISO 10545-15	Available by product	
Slight differences in colour	ISO 10545-16	Available by product	
Slide	CEN/TS 16165	-	
Reaction to fire (no mesh)	EN 13501-I	A1	
Reaction to fire (with mesh)		Available by product	
Adhesion	EN 12004	Type C1 >0.5 N/mm^2	
Tactile properties	CEN/TS 15209	Available by product	

LIFE CYCLE DESCRIPTION

Information modules and system boundaries

The considered system includes the following modules and processes:

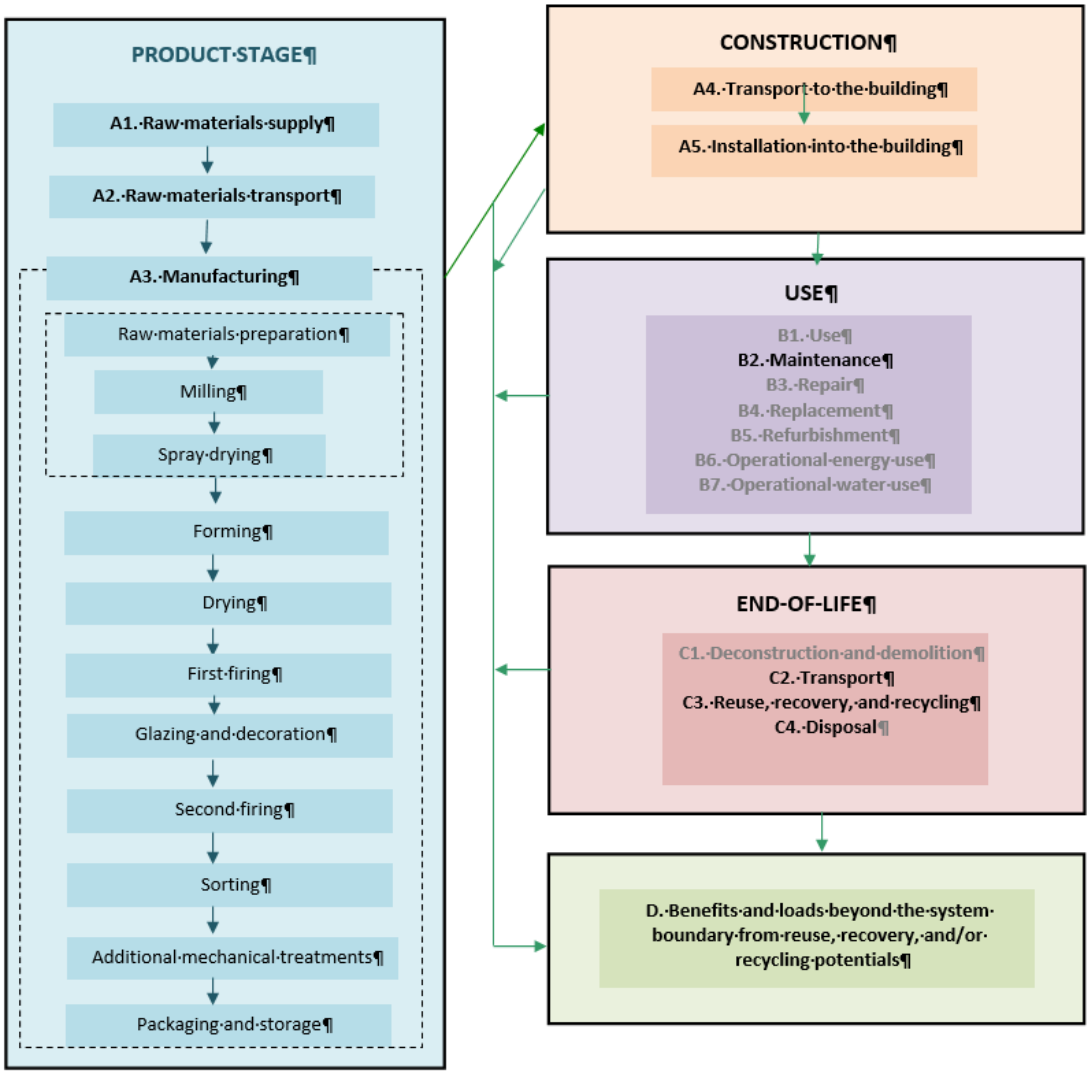

Figure 1 System boundaries

This environmental product declaration refers to the environmental performance of the earthenware product marketed by CERAMICAS APARICI taking into account its entire life cycle, and including the following stages:

Product stage:

Raw materials extraction and processing (A1)

Transport to the manufacturer (A2)

Manufacturing (A3)

Construction:

Transport to the building site (A4)

Installation into the building (A5)

Use:

Use or application of the installed product (B1)

Maintenance (B2)

Repair (B3)

Replacement (B4)

Refurbishment (B5)

Operational energy use (B6)

Operational water use (B7)

End-of-life:

Deconstruction and demolition (C1)

Transport to waste processing (C2)

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

Disposal (C4)

Module D: Benefits and loads beyond the system boundary from reuse, recovery, and/or recycling potentials

Life cycle description

PRODUCT STAGE

Raw materials supply (A1)

The earthenware product essentially consists of a body and a fine decorative surface coating. The body accounts for 94% of the total weight of the tile and consists of clay, sand, feldspar, and recycled ceramic material.

The decoration materials are manufactured at specialised companies, 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 usually wet milled. The most common glaze raw materials are quartz, kaolin, alkaline feldspars, calcium carbonate, borates, zircon, clay, calcined alumina, ceramic frits, pigments, and additives such as suspending agents, deflocculants, or binders.

No end-product components are included in the Candidate List of Substances of Very High Concern for Authorization.

Raw materials transport (A2)

The raw materials used have different origins, in accordance with their nature and properties. The arriving raw materials that are transported by freighter reach the port of Castellón and are hauled from there by truck to the manufacturing facilities. For sea transportation, a transoceanic type of freighter was chosen; the distance travelled differs in each case, depending on the origin. The raw materials are transported in bulk, that is, they require no packaging material.

Manufacturing (A3)

After the materials have been received at the spray-dried granule production plant and stored in semi-closed and closed sheds, they are proportioned and mixed in appropriate quantities. These raw materials are subjected to a wet milling process followed by a drying process to obtain the spray-dried granules.

The spray-dried powder supplier has a heat and electric energy cogeneration system installed at the spray dryer. The cogeneration produces electricity using the waste heat from combustion, through a system of steam turbines and alternators. All the hot gases are used in the spray dryer. A part of the generated electric energy is used in the production process, thus reducing the electricity demand from the grid, while the rest is sold to the grid.

Once the spray-dried granules have been manufactured, they are transported in bulk in a 27 t dump truck from the spray-dried powder producer to the factory. At the factory, the spray-dried powder is unloaded into storage hoppers. A feed system of conveyor belts with weight control then conveys the granules to the forming stage.

The tiles are formed by dry uniaxial pressing and fed into a continuous dryer to reduce tile moisture content, thus doubling or tripling tile mechanical strength for subsequent processing.

Some of these pieces are subjected to a double-firing process, that is, these tiles undergo a first firing after exiting the dryer, whereas the rest are glazed and decorated before they undergo a single firing process.

The glazing and decoration processes consist in applying one or more layers of glaze and engobes using various techniques, such as waterfall, bell glazing, spraying (discing) and inject application.

Firing is the most important stage in the ceramic tile production process because it is when the properties of the formed tiles are fundamentally changed, yielding a hard material that is resistant to water and chemicals. The products are fired in single-deck roller kilns.

Once the tiles have been fired, additional mechanical treatments are applied, as required, to given tiles to provide them with specific characteristics. The most common treatments are polishing (enhancing tile surface gloss by an abrasion process) and rectification (edge-grinding, so that there are not noticeable joints between the tiles once they are installed).

After the tiles have passed the relevant quality control processes, also known as sorting, they are packaged using cardboard, pallets, and polyethylene. The prepared pallet is then stored in the logistics area of the plant.

In order to reduce air emissions from the different sources, so-called fabric filter baghouses and wet filters are used: the former consists of a textile membrane that is permeable to gases but retains dust, while the latter consists of a curtain or shower of recycled water that carries away the dust particles.

CONSTRUCTION

Transport to the building (A4)

Product distribution is as follows: 27% in Spain, 26% in Europe, and 47% to the rest of the world. Three transport scenarios were estimated, see Table 2.

Table 2. Scenarios applied to transport the product to the place of installation

Destination	Means of transport	Distance (km)
National	27 t truck	300
Europe	27 t truck	1390
Rest of the World	Transoceanic freighter	6250

Road transport was estimated based on a 27t truck, EURO VI class. Transcontinental transport was estimated based on an average transoceanic freighter. All models used are included in the database [GaBi v.9].

Installation into the building (A5)

The product is then duly unpacked for installation. Data show that, in a real scenario, the tiles need to 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.

Tile packaging waste is separately handled; the disposal mode depends on the geographic location of the installation site.

USE

Once it is installed, the earthenware product requires no energy input for use. Nor does it require any maintenance after installation, except normal cleaning operations. Consequently, of all the modules mentioned previously, only the environmental loads related to product maintenance are considered (Module B2). The rest of life cycle modules are considered as no relevant.

According to CERAMICAS APARICI, 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 replacing. The product is assumed to have a service life of 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. The present study has considered water and disinfectant consumption thrice a year in a residential use scenario.

END-OF-LIFE

Deconstruction and demolition (C1)

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

Transport (C2)

Product waste is transported in a truck that conforms to Euro VI regulations, over a distance of 50 km to the waste destination.

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

Based on the distribution of tiles (A5), and the latest statistical data (Eurostat, 2016), 70% of the construction and demolition waste is assumed to go to reuse, recovery, and recycling.

Disposal (C4)

Thirty per cent of the product is sent to a controlled landfill.

MODULE D: Benefits and loads beyond the system boundary from reuse, recovery, and/or recycling potentials

It is assumed that loads are avoided in 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.

ENVIRONMENTAL INFORMATION

It should be borne in mind that this EPD may not be directly comparable with EPDs developed in other programmes due to possible differences in assumptions, scope, and calculation rules.

It should further be noted that comparison of construction products shall be with regard to the same function, using the same functional unit and building level (or architectural or engineering work), i.e. including the performance of the product throughout its life cycle and considering the specifications of European standard EN 15804+A1.

Environmental impact indicators

The following table sets out the averaged data of the assessed impact indicators related to 1m^2 of surface covered with earthenware tiles inside a home for 50 years. The minimum and maximum values of the tiles included in this Environmental Product Declaration are detailed in the Annexes.

The LCA was performed with the support of the GABI 9.1.053 software for Life Cycle Assessment and Thinkstep 8.007, Ecoinvent v 2.0 and ELCD v.3.3. databases.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 3. Parameters describing the environmental impacts of 1 m² of earthenware tiles (BIII) [average values]

	GWP [kg CO_2 eq.	ODP [kg CFC11 eq.]	AP [kg SO_2 eq.]	EP [kg Phosphate eq.]	POCP [kg Ethene eq]	ADP-Element [kg Sb-Equiv.]	ADP-fosil [MJ]
A1	4.3	4.3E-08	1.5E-02	2.4E-03	1.1E-03	8.0E-06	60.0
A2	2.9E-01	4.7E-11	9.5E-04	1.3E-04	7.1E-05	2.0E-08	3.9
A3	11.9	-3.0E-10	9.0E-03	1.2E-03	9.7E-04	5.3E-07	156.0
A4	3.8E-01	6.2E-17	3.5E-04	7.1E-05	4.6E-05	2.9E-08	5.1
A5	4.7E-01	5.0E-14	5.3E-04	2.1E-04	6.8E-05	4.4E-07	1.6
B2	2.3E-02	1.3E-08	1.4E-04	3.4E-05	4.6E-05	3.6E-08	1.2E-01
C2	9.1E-02	1.5E-17	7.1E-05	1.6E-05	1.0E-05	7.0E-09	1.2
C3	0	0	0	0	0	0	0
C4	6.3E-02	6.4E-14	3.7E-04	5.1E-05	2.9E-05	2.3E-08	8.1E-01
D	-2.8E-01	-3.9E-09	-1.1E-03	-1.2E-04	-1.2E-04	-7.4E-08	-6.7

A1. Raw materials
A2. Transport
A3. Manufacturing
A4. Transport
A5. Installation

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. Benefits and loads beyond the system boundary

GWP: Global Warming Potential

ODP: Ozone Layer Depletion Potential

AP: Acidification Potential

EP: Eutrophication Potential

POCP: Photochemical Ozone Creation Potential

ADPE: Abiotic Depletion Potential for non-fossil resources

ADPF: Abiotic Depletion Potential for fossil resources

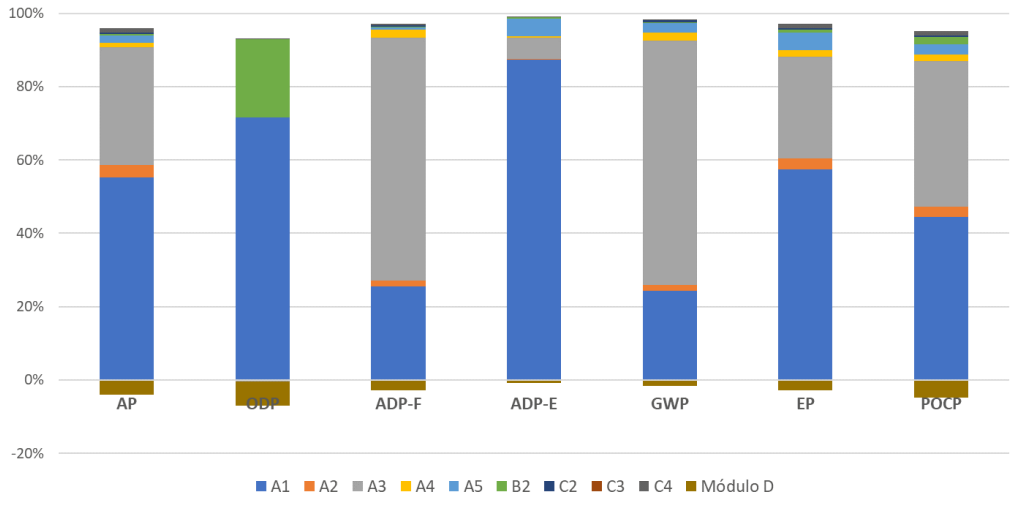

Figure 2. Environmental profile of 1m² of earthenware tile (Group BIII).

Indicators describing the resource use

The following table sets out the averaged data of the parameters describing resource use associated to life cycle of 1m^2 of earthenware tiles. The minimum and maximum values of the tiles included in this Environmental Product Declaration are detailed in the Annexes.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 4. Parameters describing the resource use of 1 m^2 of earthenware tiles (BIII) [average values]

Parameter	Unit	A1	A2	A3	A4	A5	B2	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw material	MJ (net calorific value)	37.5	1.9E-01	9.4	3.0E-01	0.4	5.1E-01	7.2E-02	0	9.8E-02	-2.5
Use of renewable primary energy resources used as raw material	MJ (net calorific value)	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources	MJ (net calorific value	37.5	1.9E-01	9.4	3.0E-01	0.4	5.1E-01	7E-02	0	9.8E-02	-2.5
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material	MJ (net calorific value	79.4	3.9	162.0	5.1	1.8	1.4E-01	1.2	0	8.4E-01	-7.3
Use of non-renewable primary energy resources used as raw materials	MJ (net calorific value	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources	MJ (net calorific value	79.4	3.9	162.0	5.1	1.8	1.4E-01	1.2	0	8.4E-01	-7.3
Use of secondary material	kg	0	0	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	0	0
Use of non-renewable secondary fuels	MJ (net calorific value	0	0	0	0	0	0	0	0	0	0
Net use of fresh water	m^3	4.7	1.5E-02	7.7E-01	2.1E-02	1.2E-01	1.1E-02	5.2E-03	0	4.7E-02	-3.4E-01

A1. Raw materials	B1. Use	C1. Deconstruction	**D. Benefits and loads beyond the system boundary**
A2. Transport	**B2. Maintenance**	**C2. Transport**	
A3. Manufacturing	B3. Repair	**C3. Waste processing**	
A4. Transport	B4. Replacement	**C4. Disposal**	
A5. Installation	B5. Refurbishment		
	B6. Operational energy use		
	B7. Operational water use		

Indicators describing the waste categories and output flows

The following tables set out the averaged data of the parameters describing waste production and output flows. The minimum and maximum values of the tiles included in this Environmental Product Declaration are detailed in the Annexes.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 5. Parameters describing the waste categories of 1 m^2 of earthenware tiles (BIII) [average values]

Parameter	Unit	A1	A2	A3	A4	A5	B2	C2	C3	C4	D
Hazardous waste	kg	4.0E-03	0	3.4E-02	0	0	0	0	0	0	5.4E-04
Non-hazardous waste	kg	9.9	1.3E-02	66.2	1.7E-02	6.9E-01	1.1E-02	4.2E-03	0	7.9	-4.8
Radioactive waste	kg	6.7E-03	5.4E-06	2.3E-03	7.0E-06	7.4E-05	1.3E-06	1.7E-06	0	1.2E-05	-3.2E-05

B1. Use
A1. Raw materials **B2. Maintenance** C1. Deconstruction
A2. Transport B3. Repair **C2. Transport** **D. Benefits and loads beyond the system boundary**
A3. Manufacturing B4. Replacement **C3. Waste processing**
A4. Transport B5. Refurbishment **C4. Disposal**
A5. Installation B6. Operational energy use
B7. Operational water use

Table 6. Parameters describing other output flows of 1 m^2 of earthenware tiles (BIII) [average values]

Parameter	Unit	A1	A2	A3	A4	A5	B2	C2	C3	C4	D
Components for reuse	kg	0	0	0	0	0	0	0	0	0	0
Materials for recycling	kg	0	0	0	0	3.0E-01	0	0	11.5	0	-2.1E-02
Materials for energy valorisation (energy recovery)	kg	0	0	0	0	0	0	0	0	0	0
Export energy	MJ	0	0	0	0	0	0	0	0	0	0

B1. Use
A1. Raw materials **B2. Maintenance** C1. Deconstruction
A2. Transport B3. Repair **C2. Transport** **D. Benefits and loads beyond the system boundary**
A3. Manufacturing B4. Replacement **C3. Waste processing**
A4. Transport B5. Refurbishment **C4. Disposal**
A5. Installation B6. Operational energy use
B7. Operational water use

ADDITIONAL ENVIRONMENTAL INFORMATION

Release of dangerous substances to air during the use stage

In the ceramic tile 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.

Release of dangerous substances to soil and water during the use stage

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, thus not producing environmental pollution, nor harming human health. It is a non-leaching product, so that it does not endanger the quality of surface water or groundwater. For further information, please, request the manufacturer's safety data sheet.

ADDITIONAL TECHNICAL INFORMATION

Module: A4-A5: Construction process stage

Module A4: Transport to the construction site

Table 7. TECHNICAL INFORMATION. Construction process stage. Transport to the construction site

Parameter	Result
Fuel type and consumption	0.1526 kg/m^2 diesel oil (27 t truck) and 0,0005 kg/m^2 fuel oil (freighter)
Distance	27% in Spain (300 km). 26% to the rest of Europe (1390 km) and 47% to the rest of the world (6250 km)
Capacity utilisation (including empty returns)	85% in trucks 100% freighter
Bulk density of the transported products	415.4 kg/m^3
Volume capacity utilisation factor (factor: =1 or < 1 or ≥ 1 for compressed or nested packaged products)	0.22

Module A5: Installation into the building

Table 8. TECHNICAL INFORMATION. Construction process stage. Installation into the building

Parameter	Result
Ancillary materials for installation:	
Material 1: Cementitious adhesive	1.5 kg/m^2
Use of fresh water	0.375l/m^2
Use of other resources	Not applicable
Quantitative description of energy type (regional mix) and consumption during the installation process	Not applicable
Wastage of materials on the construction site before waste processing, generated by the product's installation (specified by type)	Packaging waste: Cardboard: 0.25 kg Plastics: 0.01 kg Wood: 0.37 kg
Output materials (specified by type) as a result of waste processing at the construction site	Incineration of cardboard: 20 g Recycled cardboard: 134 g Landfill disposal of cardboard: 58 g Incineration of plastics: 8 g Recycled plastics: 937 g Landfill disposal of plastics: 22 g Incineration of wood: 57 g Recycled wood: 357 g Landfill disposal of wood: 161 g
Direct emissions to ambient air, soil, and water	Not applicable

Module: B1-B7: Use stage

Use stage related to the building fabric

Table 9. TECHNICAL INFORMATION. Use stage related to the building

Parameter	Result
B2 MAINTENANCE	
Maintenance process	Washing thrice a year with water and detergent (residential use)
Maintenance cycle	Not applicable
Ancillary materials for maintenance (e.g. cleaning agent) (specify materials)	Detergent: 1.34E-04 kg/washing
Wastage material during maintenance (specify materials)	Not applicable
Net fresh water consumption	0.1 l/washing
Energy input during maintenance (e.g. vacuum cleaning), energy carrier type (e.g. electricity), and amount, if applicable and relevant	Not applicable
B3 REPAIR	
Repair process	Not applicable
Inspection process	Not applicable
Repair cycle	Not applicable
Ancillary materials (e.g. lubricant, specify materials)	Not applicable
Wastage material during repair (specify materials)	Not applicable
Net fresh water consumption	Not applicable
Energy input during repair (e.g. crane activity), energy carrier type (e.g. electricity), and amount	Not applicable
B4 REPLACEMENT	
Replacement cycle	Not applicable
Energy input during replacement (e.g. crane activity), energy carrier type (e.g. electricity), and amount, if applicable and relevant	Not applicable
Exchange of worn parts during the product's life cycle (e.g. zinc-galvanised steel sheet), specify materials	Not applicable
B5 REFURBISHMENT	
Refurbishment process	Not applicable
Refurbishment cycle	Not applicable
Energy input during refurbishment (e.g. crane activity), energy carrier type (e.g. electricity), and amount, if applicable and relevant	Not applicable
Material for refurbishment (e.g. bricks), including ancillary materials for the refurbishment process (e.g. lubricant, specify materials)	Not applicable
Wastage material during refurbishment (specify materials)	Not applicable
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants)	Not applicable

Reference service life

Table 10. TECHNICAL INFORMATION. Reference service life

Parameter	Result
Reference service life	At least 50 years
Declared product properties (at the gate) and finishes, etc.	Values of the relevant characteristics according to standard EN 14411, Annex L Information included in the manufacturer's technical data sheet, according to the model.
Design application parameters (manufacturer's instructions), including the references to appropriate practices	CERAMICAS APARICI has instructions for installation, cleaning, and maintenance of ceramic tiles
An assumed quality of work, when installed in accordance with the manufacturer's instructions	CERAMICAS APARICI has instructions for installation, cleaning, and maintenance of ceramic tiles
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 standard EN 14411, Annex L Information included in the manufacturer's technical data sheet, according to the model.
Indoor environment (indoor applications), e.g. temperature, moisture, chemical exposure	Values of the relevant characteristics according to standard EN 14411, Annex L Information included in the manufacturer's technical data sheet, according to the model.
Usage conditions, e.g. frequency of use, mechanical exposure	Information included in the manufacturer's technical data sheet according to the model.
Maintenance, e.g. required frequency, type and quality and replacement of replaceable components	CERAMICAS APARICI has instructions for installation, cleaning, and maintenance of ceramic tiles

B6 Energy use and B7 Water use

Table 11. TECHNICAL INFORMATION. Energy use and water use

Parameter	Result
Ancillary materials, specified by materials	Not applicable
Net fresh water consumption	Not applicable
Energy carrier type, e.g. electricity, natural gas, urban heating	Not applicable
Equipment output power	Not applicable
Characteristic performances (e.g. energy efficiency, emissions, variation in output with capacity utilisation)	Not applicable
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants)	Not applicable

Module C1-C4: End-of-life stage

Table 12. TECHNICAL INFORMATION. End-of-life stage

Parameter	Result
Collection process specified by type	17.7 kg/m^2 collected with mixed construction and demolition waste
Recovery system specified by type	12.4 kg/m^2 for recycling
Disposal specified by type	5.3 kg/m^2 to a controlled landfill
Assumptions for scenario development (e.g. transportation)	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 Spanish PCR for ceramic coverings.

ANNEX I. Results of the LCA for the size with minimum environmental impact

Environmental impact indicators

The following table sets out the data of the assessed impact indicators with regard to the commercial size of earthenware tiles marketed by CERAMICAS APARICI and included in this EPD with the lowest environmental impact: 20x20 cm with 6.5mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view according.

Table 13. Parameters describing the environmental impacts of 1 m^2 of earthenware tiles (BIII), size 20x20 cm [values of the size with the lowest environmental impact]

	GWP [kg CO_2 eq.]	ODP [kg CFC11 eq.]	AP [kg SO_2 eq.]	EP [kg Phosphate eq.]	POCP [kg Ethene eq]	ADP-Element [kg Sb-Equiv.]	ADP-fosil [MJ]
A1	4.0	4.1E-08	1.5E-02	2.3E-03	1.0E-03	7.6E-06	55.0
A2	2.0E-01	4.6E-11	6.6E-04	9.1E-05	5.0E-05	1.4E-08	2.7
A3	8.8	-2.5E-10	5.2E-03	8.3E-04	6.6E-04	3.3E-07	115.0
A4	2.6E-01	4.3E-17	2.5E-04	5.0E-05	3.2E-05	2.0E-08	3.5
A5	3.7E-01	3.8E-14	4.1E-04	1.7E-04	5.5E-05	3.3E-07	1.3
B2	1.7E-02	9.8E-09	1.1E-04	2.6E-05	3.5E-05	2.8E-08	9.0E-02
C2	7.0E-02	1.2E-17	5.4E-05	1.2E-05	8.0E-06	5.4E-09	9.4E-01
C3	0	0	0	0	0	0	0
C4	4.9E-02	5.0E-14	2.9E-04	4.0E-05	2.3E-05	1.8E-08	6.4E-01
D	-2.1E-01	-2.9E-09	-8.3E-04	-8.7E-05	-8.9E-05	-5.5E-08	-5.0

A1. Raw materials
A2. Transport
A3. Manufacturing
A4. Transport
A5. Installation

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. Benefits and loads beyond the system boundary

GWP: Global Warming Potential

ODP: Ozone Layer Depletion Potential

AP: Acidification Potential

EP: Eutrophication Potential

POCP: Photochemical Ozone Creation Potential

ADPE: Abiotic Depletion Potential for non-fossil resources

ADPF: Abiotic Depletion Potential for fossil resources

Indicators describing the resource use

The following table sets out the data of the parameters describing resource use with regard to the commercial size of earthenware tiles marketed by CERAMICAS APARICI and included in this EPD with the lowest environmental impact: 20x20 cm with 6.5mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 14. Parameters describing the resource use of 1 m² of earthenware tiles (BIII), size 20x20 cm [values of the size with the lowest environmental impact]

Parameter	Unit	A1	A2	A3	A4	A5	B2	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw material	MJ (net calorific value)	34.7	1.3E-01	5.4	2.1E-01	2.9E-01	3.9E-01	5.5E-02	0	7.7E-02	-2.0
Use of renewable primary energy resources used as raw material	MJ (net calorific value)	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources	MJ (net calorific value	34.7	1.3E-01	5.4	2.1E-01	2.9E-01	3.9E-01	5.5E-02	0	7.7E-02	-2.0
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material	MJ (net calorific value	73.4	2.7	118.0	3.6	1.4	1.0E-01	9.4E-01	0	6.6E-01	-5.4
Use of non-renewable primary energy resources used as raw materials	MJ (net calorific value	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources	MJ (net calorific value	73.4	2.7	118.0	3.6	1.4	1.0E-01	9.4E-01	0	6.6E-01	-5.4
Use of secondary material	kg	0	0	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	0	0
Use of non-renewable secondary fuels	MJ (net calorific value	0	0	0	0	0	0	0	0	0	0
Net use of fresh water	m^3	4.3	9.8E-03	5.1E-01	1.5E-02	9.4E-02	8.0E-03	3.9E-03	0	3.7E-02	-2.5E-01

A1. Raw materials
A2. Transport
A3. Manufacturing
A4. Transport
A5. Installation

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. Benefits and loads beyond the system boundary

Indicators describing the waste categories and output flows

The following tables set out the data of the parameters describing waste production and output flows with regard to the commercial size of earthenware tiles marketed by CERAMICAS APARICI with the lowest environmental impact: 20x20 cm with 6.5mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 15. Parameters describing the waste categories of 1 m² of earthenware tiles (BIII), size 20x20 cm [values of the size with the lowest environmental impact]

Parameter	Unit	A1	A2	A3	A4	A5	B2	C2	C3	C4	D
Hazardous waste	kg	3.6E-03	0	2.8E-02	0	0	0	0	0	0	4.0E-04
Non-hazardous waste	kg	8.1	8.9E-03	18.2	1.2E-02	5.5E-01	8.0E-03	3.2E-03	0	6.2	-3.6
Radioactive waste	kg	6.3E-03	3.8E-06	1.4E-03	4.8E-06	5.7E-05	1.0E-06	1.3E-06	0	9.0E-06	-2.4E-05

A1. Raw materials
A2. Transport
A3. Manufacturing
A4. Transport
A5. Installation

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. Benefits and loads beyond the system boundary

Table 16. Parameters describing other outputs flows of 1 m² of earthenware tiles (BIII), size 20x20 cm [values of the size with the lowest environmental impact]

Parameter	Unit	A1	A2	A3	A4	A5	B2	C2	C3	C4	D
Components for reuse	kg	0	0	0	0	0	0	0	0	0	0
Materials for recycling	kg	0	0	0	0	2,3E-01	0	0	8,7	0	-1,7E-02
Materials for energy valorisation (energy recovery)	kg	0	0	0	0	0	0	0	0	0	0
Export energy	MJ	0	0	0	0	0	0	0	0	0	0

A1. Raw materials
A2. Transport
A3. Manufacturing
A4. Transport
A5. Installation

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. Benefits and loads beyond the system boundary

ANNEX II. Results of the LCA for the size with maximum environmental impact

Environmental impact indicators

The following table sets out the data of the assessed impact indicators with regard to the commercial size of earthenware tiles marketed by CERAMICAS APARICI and included in this EPD with the highest environmental impact: 29.75x59.55 cm and 10.3 mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 17. Parameters describing the environmental impacts of 1 m^2 of earthenware tiles (BIII), size 29.75x59.55 cm [values of the size with the greatest environmental impact]

	GWP [kg CO_2 eq.]	ODP [kg CFC11 eq.]	AP [kg SO_2 eq.]	EP [kg Phosphate eq.]	POCP [kg Ethene eq]	ADP-Element [kg Sb-Equiv.]	ADP-fosil [MJ]
A1	5.4	5.1E-08	1.8E-02	2.7E-03	1.3E-03	9.5E-06	72.6
A2	5.5E-01	5.2E-11	2.2E-03	2.7E-04	1.5E-04	3.9E-08	7.5
A3	16.8	-3.0E-10	2.4E-02	1.9E-03	1.8E-03	1.2E-06	219.0
A4	7.8E-01	1.3E-16	6.5E-04	1.4E-04	9.1E-05	6.0E-08	10.5
A5	5.1E-01	6.6E-14	6.7E-04	1.9E-04	7.0E-05	5.8E-07	2.1
B2	3.0E-02	1.7E-08	1.9E-04	4.6E-05	6.1E-05	4.8E-08	1.6E-01
C2	1.2E-01	2.0E-17	9.4E-05	2.1E-05	1.4E-05	9.3E-09	1.6
C3	0	0	0	0	0	0	0
C4	7.3E-02	7.4E-14	4.3E-04	5.9E-05	3.4E-05	2.6E-08	9.4E-01
D	-4.2E-01	-6.1E-09	-1.7E-03	-1.7E-04	-1.8E-04	-1.1E-07	-10.1

A1. Raw materials
A2. Transport
A3. Manufacturing
A4. Transport
A5. Installation

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. Benefits and loads beyond the system boundary

GWP: Global Warming Potential

ODP: Ozone Layer Depletion Potential

AP: Acidification Potential

EP: Eutrophication Potential

POCP: Photochemical Ozone Creation Potential

ADPE: Abiotic Depletion Potential for non-fossil resources

ADPF: Abiotic Depletion Potential for fossil resources

Indicators describing the resource use

The following table sets out the data with regard to the commercial size of earthenware tiles marketed by CERAMICAS APARICI with the highest environmental impact: 29.75x59.55 cm and 10.3 mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 18. Parameters describing the resource use of 1 m² of earthenware tiles (BIII), size 29.75x59.55 cm [values of the size with the greatest environmental impact]

Parameter	Unit	A1	A2	A3	A4	A5	B2	C2	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw material	MJ (net calorific value)	44.2	3.8E-01	24.1	6.1E-01	5.0E-01	6.7E-01	9.5E-02	0	1.1E-01	-2.6
Use of renewable primary energy resources used as raw material	MJ (net calorific value)	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources	MJ (net calorific value	44.2	3.8E-01	24.1	6.1E-01	5.0E-01	6.7E-01	9.5E-02	0	1.1E-01	-2.6
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material	MJ (net calorific value	95.4	7.5	234.0	10.6	2.3	1.8E-01	1.6	0	9.8E-01	-11.0
Use of non-renewable primary energy resources used as raw materials	MJ (net calorific value	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources	MJ (net calorific value	95.4	7.5	234.0	10.6	2.3	1.8E-01	1.6	0	9.8E-01	-11.0
Use of secondary material	kg	0	0	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	0	0
Use of non-renewable secondary fuels	MJ (net calorific value	0	0	0	0	0	0	0	0	0	0
Net use of fresh water	m^3	6.4	2.9E-02	1.5	4.4E-02	1.6E-01	1.4E-02	6.8E-03	0	5.4E-02	-4.6E-01

A1. Raw materials	B1. Use	C1. Deconstruction	**D. Benefits and loads beyond the system boundary**
A2. Transport	**B2. Maintenance**	**C2. Transport**	
A3. Manufacturing	B3. Repair	**C3. Waste processing**	
A4. Transport	B4. Replacement	**C4. Disposal**	
A5. Installation	B5. Refurbishment		
	B6. Operational energy use		
	B7. Operational water use		

Indicators describing waste categories and output flows

The following tables set out the data of the parameters describing waste production and output flows with regard to the commercial size of earthenware tiles marketed by CERAMICAS APARICI with the highest environmental impact: 29.75x59.55 cm and 10.3 mm thickness.

The life cycle modules not shown in the table are considered irrelevant from an environmental point of view.

Table 19. Parameters describing the waste categories of 1 m² of earthenware tiles (BIII), size 29.75x59.55 cm [values of the size with the greatest environmental impact]

Parameter	Unit	A1	A2	A3	A4	A5	B2	C2	C3	C4	D
Hazardous waste	kg	4.3E-03	0	2.9E-02	0	0	0	0	0	0	8.9E-04
Non-hazardous waste	kg	14.1	2.4E-02	395.0	3.5E-02	7.6E-01	1.4E-02	5.5E-03	0	9.2	-6.7
Radioactive waste	kg	7.9E-03	1.0E-05	5.9E-03	1.4E-05	9.7E-05	1.8E-06	2.2E-06	0	1.3E-05	-4.6E-05

B1. Use
A1. Raw materials — **B2. Maintenance** — C1. Deconstruction
A2. Transport — B3. Repair — **C2. Transport**
A3. Manufacturing — B4. Replacement — **C3. Waste processing** — **D. Benefits and loads beyond the system boundary**
A4. Transport — B5. Refurbishment — **C4. Disposal**
A5. Installation — B6. Operational energy use
B7. Operational water use

Table 20. Parameters describing other outputs flows of 1 m² of earthenware tiles (BIII), size 29.75x59.55 cm [values of the size with the greatest environmental impact]

Parameter	Unit	A1	A2	A3	A4	A5	B2	C2	C3	C4	D
Components for reuse	kg	0	0	0	0	0	0	0		0	0
Materials for recycling	kg	0	0	0	0	4.1E-01	0	0	17.6	0	-1.6E-02
Materials for energy valorisation (energy recovery)	kg	0	0	0	0	0	0	0	0	0	0
Export energy	MJ	0	0	0	0	0	0	0	0	0	0

B1. Use
A1. Raw materials — **B2. Maintenance** — C1. Deconstruction
A2. Transport — B3. Repair — **C2. Transport**
A3. Manufacturing — B4. Replacement — **C3. Waste processing** — **D. Benefits and loads beyond the system boundary**
A4. Transport — B5. Refurbishment — **C4. Disposal**
A5. Installation — B6. Operational energy use
B7. Operational water use