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A VERIFIED ENVIRONMENTAL DECLARATION



Environmental  
product  
declaration  
**Ceramic tiles,  
glazed ceramic tiles**  
(B1b clasification according to EN 14411:2013)

EN ISO 14025:2010  
EN 15804:2012

**Designation Code:** GlobalEPD 002-022  
**Date of first issue:** 06/11/2014  
**Date of this issue:** 06/11/2014  
**Expiry date:** 05/11/2019

**ecoceramic**

## CONTENTS

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- 1 General information
- 2 Product
- 3 Life cycle assessment
- 4 Verification

## 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 C142416, 24 of September, 2014.

Commissioned by:  
Pamesa Cerámica S.L.  
Cno. Alcora nº 8, Apdo. Correos 14  
12550 Almazora, Castellón. España.

### 1.2. Identification of the product

This environmental product declaration describes the environmental information based on a life cycle assessment of glazed ceramic tile (B1b water absorption group) manufactured by PAMESA CERÁMICA S.L., considering the geographical and technical coverage of Spain during 2013.

The ceramic tiles included in the study belong to the B1b water absorption group according to UNE-EN 14411:2013 (equivalent to ISO 13006:2012); i.e they have a water absorption between 0,5% and 3% (also known as glazed ceramic tile). The product sizes considered within the scope of the study are 45x45 cm and 60x60 cm

The location of the factory is:  
PAMESA CERÁMICA S.L.  
Camino Alcora nº 8  
12550 Almazora, Castellón. España

### 1.3. Declared or functional unit

The Declared Unit is “1 m<sup>2</sup> covering of a (floor, partitions and façade) surface with glazed ceramic tiles (B1b group)”.

### 1.4. Name of the Program

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Phone: (+34) 91 432 60 00  
e-mail: aenordap@aenor.es - www.aenor.es

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
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 002-022 is issued on 2014-11-06 and will be valid for 5 years.

## 1.8. Information modules

The life cycle stages considered are:

### Product stage:

Raw materials extraction and processing (A1)  
Transport to the manufacturer (A2)  
Manufacturing (A3)

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

This EPD is thus "cradle to gate with options".

## Product stage (modules A1, A2 Y A3)

### Raw materials supply (A1)

The basic materials for these tiles are mainly clay, feldspar, sand, recovered ceramic material generated after the firing and additives.

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, defloculants, or binders.

### Transport (A2)

Raw materials have different sources according to their nature and properties.

All raw materials are transported in bulk, i.e. with no packing. Based on the distances, raw materials are transported by land, using tracks, or shipped using cargo freighters.

### Manufacturing (A3)

Both the preparation of the raw materials and the manufacturing of the tiles are made in the factory of PAMESA CERÁMICA S.L. (hereinafter referred to as PAMESA).

In this factory the dosage and the mix using the appropriate rations is made, after the reception of the materials and its storage in a warehouse. These raw materials are first grinded with a wet process and then dried to obtain an atomized granule. Only in case of feldspars there is a pre-treatment to ensure they are acceptable for the use.

The drying process by atomization includes a system of cogeneration for combined heat and electric power. In this cogeneration process electricity is generated using a system of gas turbines; part of the heated gases generated during the combustion of the natural gas for electric power is used in the atomization process. Both the heated gases and part of the electric power generated are incorporated and used in the manufacturing process itself, thus reducing the energy demand from the grid.



The atomized granules are stored in silos. Using a feeding system that uses belts with weight control, it is sent to the forming stage.

Once the tiles are formed using unidirectional pressing with a dry process, they are sent to a dryer with a continuous process to reduce moisture and thus increase the mechanical resistance, to allow the downstream processing.

Once the tiles are removed from the dryer they are decorated with a slim layer of ceramic glaze. This glaze is manufactured in specialized factories located in the same region of Castellón.

Part of the raw materials used for decoration is fritted (fusion of the raw materials and sudden cooling, obtaining insoluble glass. This fritted raw materials, and the rest, are milled with a wet process in the factory of PAMESA, and other techniques are applied like bells and disks. Over these pieces an additional decoration can be applied with ink injection or gravure.

Once the pieces are decorated, they are fired in a single layer oven with roller. This 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 that has, generally, high performance.

After the quality control procedures, also known as sorting, some pieces are treated with additional mechanical surface treatments, to obtain new effects in the ceramic pieces. These treatments are made in the factory of PAMESA and are pre-cuts, cuts, surface polishing, beveling, etc. For the packaging of the pieces cardboard, pallets, and polyethylene is used. Once the pallet is prepared is stored in the logistic area of the factory.

All the waste from raw ceramic pieces and ceramic sludge are managed by the manufacturers of the atomized granule, to be incorporated in the process as raw material

for the manufacturing of ceramic tiles; regarding the waste of fired pieces they are all recovered to be for the atomized granule (raw materials) or managed to be recycled in other construction products.

#### **Module D: Benefits and loads beyond the product system boundary**

The avoided loads related with the management of the waste from packaging generated in the manufacturing stage.

#### **1.9. Representativeness of the EPD**

This Environmental Product Declaration contains environmental information regarding tiles of the water absorption group Bib for the formats 45x45 cm and 60x60 cm. It follows the PCR for ceramic coverings v.001, RCP number 2 of AENOR GlobalEPD program, and the results will be presented separately.

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 please contact the manufacturer, PAMESA CERÁMICA S.L., via web <http://www.pamesa.com> or using the following email: [nacional@pamesa.com](mailto:nacional@pamesa.com) (Spain) or [export@pamesa.com](mailto:export@pamesa.com) (International).

## 2 Product

### 2.1. Description of the product

This Environmental Product Declaration covers the ceramic tiles from the water absorption group BIb (glazed ceramic tile), the classification is based on EN 14411:2013:2013 (equivalent to ISO 13006:2012), the geographical and technical coverage of Spain with data from 2013.

The glazed ceramic tile included in the study covers different models, the formats within the scope of the study are 45x45 cm and 60x60 cm.



Figure 1 – Installed product

### 2.2. Application of the product

The intended use of the product is surface covering. Generally, this product is used for floorings, but it can also be used for wall cladding. In addition, the versatility of the ceramic tile also allows the installation in different environments such as in homes, offices, shops, hospitals, etc. For further information please contact the manufacturer to obtain the technical sheet of the product for each model.

The life cycle assessment (LCA) on which this declaration was performed according to standards ISO 14040 and ISO 14044 and the PCR document on ceramic coverings V.001, PCR nº 2 of AENOR GlobalEPD.

The Declared Unit is “1 m<sup>2</sup> covering of a surface (floor, partitions and façade) with glazed ceramic tile (water absorption group BIb)”.

This LCA is of the “cradle-to-grave with options” type; i.e. it includes the product manufacturing with additional modules (module D in this case), but not covering the full life cycle.

### 2.3. Product components

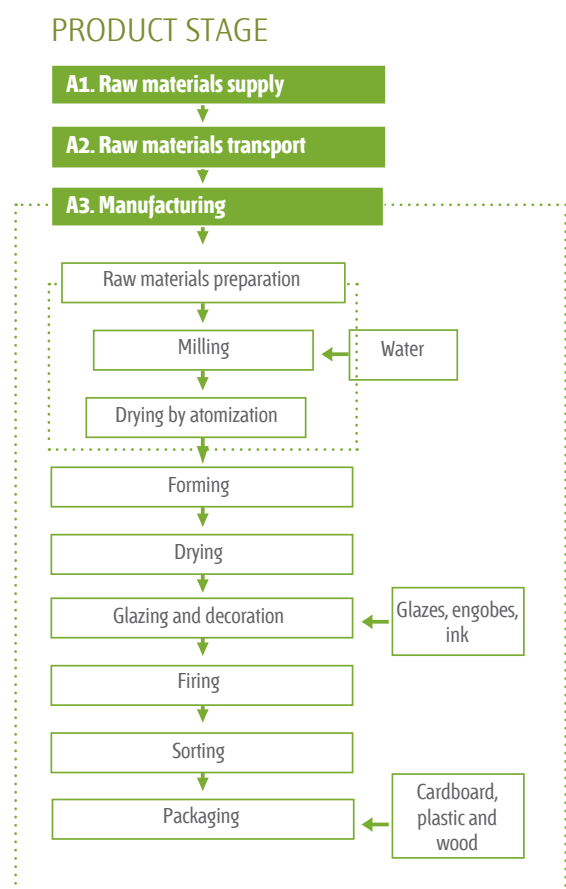
None of the end-product components are included in the Candidate List of substances of very high concern for authorisation.

Body raw materials (95%): clay, recycled fired and unfired ceramic material and additives

Glaze raw materials (5%): 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



### 3.2.1 Impact indicators

The following tables set out the environmental data associated to the life cycle of 1 m<sup>2</sup> of glazed ceramic tile (B1b group) for the formats 45x45 cm and 60x60 cm.

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.

D. Benefits and loads beyond the system boundary from reuse, recovery and recycling

### 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.

IMPACT CATEGORY	PARAMETER	UNIT	LIFE CYCLE STAGES			
			PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
			A1	A2	A3	D
Global warming	Global warming potential	kg CO <sub>2</sub> equiv	2,0	2,8E-01	5,3	-1,7E-02
Ozone depletion	Ozone depletion potential	kg CFC-11 equiv	2,5E-07	5,0E-10	2,2E-07	-1,8E-09
Acidification for soil and water	Acidification potential of soil and water	kg SO <sub>2</sub> equiv	1,1E-02	5,6E-03	1,2E-02	-2,3E-05
Eutrophication	Eutrophication potential	kg (PO <sub>4</sub> ) <sup>3-</sup> equiv	7,6E-04	6,4E-04	2,0E-03	-8,7E-06
Photochemical ozone formation	Photochemical ozone formation potential	kg Ethene equiv	8,9E-04	3,6E-04	8,1E-04	-9,6E-06
Depletion of abiotic resources - elements	Abiotic depletion potential for non fossil resources	kg Sb equiv	1,4E-04	5,6E-09	4,8E-07	-5,6E-09
Depletion of abiotic resources – fossil fuels	Abiotic depletion potential for fossil resources	MJ (net calorific value)	26,0	3,6	66,6	-3,6E-01
<div> <div>A1. Raw materials supply A2. Transport</div> <div>A3. Production D. Reuse, recovery and recycling potential</div> </div>						

**Table 1.** Parameters describing environmental impacts for glazed stoneware (BIb) [45x45 cm]



IMPACT CATEGORY	PARAMETER	UNIT	LIFE CYCLE STAGES			
			PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
			A1	A2	A3	D
Global warming	Global warming potential	kg CO <sub>2</sub> equiv	2,1	3,1E-01	6,6	-1,7E-02
Ozone depletion	Ozone depletion potential	kg CFC-11 equiv	2,7E-07	5,6E-10	3,7E-07	-1,8E-09
Acidification for soil and water	Acidification potential of soil and water	kg SO <sub>2</sub> equiv	1,2E-02	6,3E-03	1,6E-02	-2,4E-05
Eutrophication	Eutrophication potential	kg (PO <sub>4</sub> ) <sup>3-</sup> equiv	8,2E-04	7,2E-04	2,3E-03	-8,7E-06
Photochemical ozone formation	Photochemical ozone formation potential	kg Ethene equiv	9,7E-04	4,0E-04	1,1E-03	-9,5E-06
Depletion of abiotic resources - elements	Abiotic depletion potential for non fossil resources	kg Sb equiv	1,4E-04	6,1E-09	6,1E-07	-5,6E-09
Depletion of abiotic resources – fossil fuels	Abiotic depletion potential for fossil resources	MJ (net calorific value)	28,3	4,0	82,0	-3,6E-01
<div> <div>A1. Raw materials supply A2. Transport</div> <div>A3. Production D. Reuse, recovery and recycling potential</div> </div>						

**Table 2.** Parameters describing environmental impacts for glazed stoneware (B1b) [60x60 cm]

### 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 m<sup>2</sup> of glazed ceramic tiles (BIb group) that covers the formats 45x45 cm and 60x60 cm.

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	3,8	4,8E-03	9,25	-0,35
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	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	3,8	4,8E-03	9,25	-0,35
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ, net calorific value	35,6	3,7	116,0	-4,4E-01
Use of non renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0
Total use of non renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	35,6	3,7	116,0	-4,4E-01
Use of secondary material	kg	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0
Use of non renewable secondary fuels	MJ, net calorific value	0	0	0	0
Net use of fresh water	m <sup>3</sup>	5,1E-02	6,9E-05	2,8E-02	-6,7E-04
<div> <div>A1. Raw materials supply</div> <div>A2. Transport</div> </div> <div> <div>A3. Production</div> <div>D. Reuse, recovery and recycling potential</div> </div>					

**Table 3.** Parameters describing use of resources for glazed stoneware tiles (BIb) [45x45 cm]

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	4,0	5,3E-03	12,8	-3,5E-01
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	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	4,0	5,3E-03	12,8	-3,5E-01
Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	MJ, net calorific value	38,8	4,0	137,0	-4,4E-01
Use of non renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0
Total use of non renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	38,8	4,0	137,0	-4,4E-01
Use of secondary material	kg	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0
Use of non renewable secondary fuels	MJ, net calorific value	0	0	0	0
Net use of fresh water	m <sup>3</sup>	5,4E-02	7,6E-05	3,1E-02	-6,7E-04
<div> <div>A1. Raw materials supply A2. Transport</div> <div>A3. Production D. Reuse, recovery and recycling potential</div> </div>					

**Table 4.** Parameters describing use of resources for glazed ceramic tiles (B1b) [60x60 cm]

### 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 m<sup>2</sup> of glazed ceramic tile of B1b group that covers the formats 45x45 cm and 60x60 cm.

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Hazardous waste disposed	kg	3,0E-03	0	4,4E-02	1,4E-04
Non hazardous waste disposed	kg	5,3	9,1E-03	66,6	2,5E-01
Radioactive waste disposed	kg	2,1E-03	6,3E-06	2,8E-03	1,9E-05
<div> <div>A1. Raw materials supply</div> <div>A2. Transport</div> </div> <div> <div>A3. Production</div> <div>D. Reuse, recovery and recycling potential</div> </div>					

**Table 5.** Parameters describing waste categories for glazed stoneware tiles (B1b) [45x45 cm]

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Hazardous waste disposed	kg	3,2E-03	0	5,2E-02	1,4E-04
Non hazardous waste disposed	kg	5,9	1,0E-02	77,4	2,5E-01
Radioactive waste disposed	kg	2,3E-03	7,0E-06	4,7E-03	1,9E-05
<div> <div>A1. Raw materials supply</div> <div>A2. Transport</div> </div> <div> <div>A3. Production</div> <div>D. Reuse, recovery and recycling potential</div> </div>					

**Table 6.** Parameters describing waste categories for glazed ceramic tiles (B1b) [60x60 cm]

PARAMETER	UNIT	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Components for re-use	kg	0	0	0	0
Materials for recycling	kg	0	0	0	-3,7E-02
Materials for energy recovery	kg	0	0	0	0
Exported energy	MJ per energy carrier	0	0	0	0
<div> <div>A1. Raw materials supply A2. Transport</div> <div>A3. Production D. Reuse, recovery and recycling potential</div> </div>					

**Table 7.** Parameters describing other output flows for glazed ceramic tiles (B1b) [45x45 cm]

PARÁMETRO	UNIDAD	LIFE CYCLE STAGES			
		PRODUCT STAGE			BENEFITS AND LOADS BEYOND THE LIFE CYCLE
		A1	A2	A3	D
Components for re-use	kg	0	0	0	0
Materials for recycling	kg	0	0	0	-3,7E-02
Materials for energy recovery	kg	0	0	0	0
Exported energy	MJ per energy carrier	0	0	0	0
<div> <div>A1. Raw materials supply A2. Transport</div> <div>A3. Production D. Reuse, recovery and recycling potential</div> </div>					

**Table 8.** Parameters describing other output flows for glazed ceramic tiles (B1b) [60x60 cm]

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

#### **3.3.1.** Indoor air emissions

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

#### **3.3.2.** 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.



## 4 Verification

<b>CEN standard EN 15804 serves as core PCR</b>	
Independent verification of the declaration and data in conformity with standard <b>EN ISO 14025:2010</b>	
<input type="checkbox"/> internal	<input checked="" type="checkbox"/> external
Third-party verifier	
<b>AENOR</b>	Asociación Española de Normalización y Certificación

Note 1: EPD developed in different program operators may not be comparable, due to differences in the assumptions, scope and calculation rules.

Note 2: Comparisons for construction product shall be made using for the same function, using the same functional unit and at building (or engineering works) level, i.e. considering the performance of the product in the full life cycle and including the specifications in UNE-EN ISO 14025, 6.7.2.

