
# EPD

## CERTIFICATION

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GlobalEPD
A VERIFIED ENVIRONMENTAL DECLARATION

AENOR
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## Environmental Product Declaration

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

## Ceramic Tiles. Earthenware (water absorption group BIII EN 14411: 2016)

Date of issue: 2020-11-11
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GlobalEPD Code: 002-053

MAINZU ceramica

**MANUFACTURA INDUSTRIAL AZULEJERA S.L. (MAINZU, S.L.)**

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

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AENOR in a founding member of ECO Platform, the European Association of Environmental Declarations Verification Programmes

| |
|---|
| GlobalEPD-RCP-002 rev. 1<br>La Norma Europea EN 15804:2012+A1:2013 sirve de base para las RCP |
| Independent verification of the declaration and data, according to EN ISO 14025:2010<br>☐ Internal ☑ **External** |
| Verification body<br>AENOR |

# 1 General information

## 1.1. The organization

MANUFACTURA INDUSTRIAL AZULEJERA, S.L. (MAINZU) is a company that cares about technology innovation investment, in fact, innovation is one of our most important characteristics.

MAINZU is in a constant search of new designs, material effects, investigating new shapes and colours.

MAINZU has been in the market for 55 years, commercializing our ceramic products in a hundred countries. This has implied a high level of professionalization of every department.

However, our most important characteristic is that we have not forgotten our origin. MAINZU was created by a ceramist family. We love our work and the personal treatment is essential for us. From our point of view, earthenware tiles are not a simple product. Our ceramic products become part of households for many years, participating in the daily life of each home.

As workers in the industry MAINZU should, in addition to supply customers with an optimum quality product, provide proposals where people could identify themselves, making it possible the personalization of every home.

## 1.2. Scope of the Declaration

This Environmental Product Declaration includes environmental information about a product aggrupation manufactured by MAINZU, in the geographical and technological environment of Spain in the year 2018.

The results show the environmental behaviour of the ceramic coverings belonging the average BIII group, as well as the environmental data of the tiles which present a minimum and maximum impact, thus delimitating the results obtained in the LCA for the average product. The scope of this Environmental Product Declaration (from now on EPD) is from cradle-to-grave.

## 1.3. Life Cycle and conformity

This EPD was drafted and verified in accordance with the EN ISO 14025:2010 and EN 15804:2012+A1:2013 Standards and the Product Category Rules (PCR) listed in table 1.

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

**Table 1.** EPD information

This EPD may not be comparable with those developed in other programs or under different reference documents; it may not be comparable with EPD that are not developed under EN 15804:2012+A1:2013 standard. In the same way, Environmental Product Declarations cannot be subject to comparison if the origin of the data is different (the databases, for example), if not all relevant information modules are included, or if they are not based on the same scenarios.

Comparison of construction products shall be based on the same function, using the same functional unit at building level (or architectural or civil engineering works), i.e. including the performance of the product during the life cycle and the requirements stated in EN ISO 14025:2010.

| | | | |
|---|---|---|---|
| Product stage | A1 | Raw material supply | X |
| | A2 | Transport | X |
| | A3 | Manufacturing | X |
| Const. | A4 | Transport to construction work | MNE |
| | A5 | Construction Installation process | MNE |
| Use stage | B1 | Use | NR |
| | B2 | Maintenance | MNE |
| | B3 | Repair | NR |
| | B4 | Replacement | NR |
| | B5 | Refurbishment | NR |
| | B6 | Operational energy use | NR |
| | B7 | Operational water use | NR |
| End of life stage | C1 | De-construction / demolition | NR |
| | C2 | Transport | MNE |
| | C3 | Waste processing | MNE |
| | C4 | Disposal | MNE |
| | D | Benefits and loads beyond the system boundary | X |

X = Information module included in LCA/EPD
MNE = Module not evaluated

**Table 2.** System boundaries. Information modules considered

# 2 The product

## 2.1. Identification of the product

This Environmental Product Declaration covers the ceramic tiles pertaining the water absorption group BIII (earthenware tiles), classification based on EN 14411:2016 (equivalent to ISO13006:20128), this is their water absorption is more than 10%.

The earthenware tiles included in the study cover different models with different formats. The thickness formats included in the scope of this EPD are from 6.8mm to 13.3mm, with an average weight of 13.6kg/$m^2$.

The results of the formats included in the boundary of the present EDP are shown in the Annexes, they present the minimum and maximum environmental impact, and correspond with the 15x20cm format of 6.8mm of thicknesses and 10x20cm format of 13.3mm of thicknesses, respectively.

## 2.2. Intended use of the product

The function of the product is to cover surfaces. In this study the environmental behaviour of the earthenware tiles as indoor house surface covering has been assessed, however, the versatility of these pieces allows them to be installed in other places, such as offices, stores, hospitals, etc.

The product features are included in the technical datasheets which can be requested from the manufacturer, being them, the ones required by the EN 14411:2016 standard.

## 2.3. Composition of the product

Ninguno de los componentes del producto final se incluye en la Lista Candidata de Sustancias muy Preocupantes sometidas a Autorización.

| Component | Content | Units |
|---|---|---|
| Clay, feldspar, sand and, deflocculants | 95% | kg/$m^2$ |
| Feldspar, carbonates, quartz, silicates, kaolin, zirconium oxide, clays, alumina, zinc oxide | 5% | kg/$m^2$ |

**Table 3.** Product components

**Figura 1.** Installed product

# 3 Information regarding the LCA

## 3.1. Life Cycle Analysis

The Life Cycle Analysis which is the base of the present EPD has been carried out from the data directly provided by the manufacturer MAINZU, concerning its earthenware tiles manufactured in 2018 in a production plant.

The Life Cycle Analysis in which this declaration is based has been carried out following the ISO 14040 and ISO 14044 standards and the GlobalEPD RCP-002 rev.1 document of ceramic coverings of the Global EPD Programme administrated by AENOR, which meets the EN 15804:2012+A1:2013 standard.

The results associated to the ceramic tiles of minimum and maximum environmental impact (which correspond with 15x20cm format of 6.8mm of thicknesses and 10x20 cm format of 13.3 mm of thicknesses respectively), are included in the Annexes I and II. The LCA has been carried out using GaBi 9.5.2.49 software and the data base version 2020.1. (SP40.0/GUP14.0) (Thinkstep). The characterization factors used are those included in EN 15804:2012+A1:2013 standard.

## 3.2. Functional Unit

The functional unit considered is **"the covering of 1 m2 house indoor surface (walls) for 50 years with ceramic tiles of BIII group"**.

## 3.3. Reference Service Life (RSL)

LThe durability of the product is the same as that of the building where it is installed, considering it is installed correctly, as it is a durable product which does not require substitution. A Reference Service Life of 50 years has been considered (see Table 4).

| 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.<br>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 | MAINZU has instructions for installation, cleaning, and maintenance of ceramic tiles. |
| An assumed quality of work, when installed in accordance with the manufacturer's instructions | MAINZU 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<br>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<br>Information included in the manufacturer's technical data sheet, according to the model. |
| Usage conditions, e.g. frequency of use, mechanical exposure | PInformation 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 | MAINZU has instructions for installation, cleaning, and maintenance of ceramic tiles |

**Table 4.** REference Service Life

**Figura 2.** Producto instalado

### 3.4. Allocation and cut off criteria

In this cradle-to-grave LCA study, a cut-off rule of 1% for the energy use (renewable and non-renewable) and 1% of total mass in those unitary processes, whose data is insufficient, have been applied. In total, more than 95% of all mass and energy inputs and outputs of the system have been included, excluding the not available nor quantified data.

The data excluded is the following:

- Diffuse particle emissions to the atmosphere during the transportation and storage of powdery nature raw materials.

- Non-regulated pollutants emitted from channelled emissions generated during combustion stages (spray drying, drying and firing).

- The recycling and reutilization of the wastes generated during the life cycle of the ceramic coverings according to LCA. However, the recycling process of the wastes and the benefits obtained from this recycled will be quantified in module D.

- Machinery and industrial equipment production due to the difficulty of inventorying every good involved, and because the LCA community considers that the environmental impact per unit of product is low in comparison with the rest of the processes which are in fact included. Moreover, the databases used do not include these processes, thus their inclusion would require an extra effort outside the scope of the present study. Additionally, the residues generated during the machinery and equipment maintenance are excluded due to the low impact they represent.

### 3.5. Representativeness, quality and selection of dat

The raw data has been directly provided by MAINZU. The secondary data comes from GaBi Thinkstep database and it has been modelized with GaBi 9.5.2.49 version. All data correspond to a 2018 geographical Spanish scene.

The results presented are representative of ceramic coverings, expressed as average values weighted by the production of the ceramic coverings pertaining BIII group, delimiting it by the products which present the minimum and maximum environmental impact.

### 3.6. Other calculation rules and hypotheses

The load assignments applied have been the necessary ones to quantify the specific data of the ceramic tiles as a covering material, as well as, to perform the necessary calculations to assign the associated data to the products which present a maximum and a minimum environmental impact.

# 4 System boundaries, scenarios and additional technical information

## 4.1. Processes previous manufacturing (upstream) and manufacturing of the product (A1-A3)

The present environmental product declaration refers to the environmental behaviour of large-format ceramic tiles manufactured by MAINZU.

All the product stage modules, relevant for the ceramic coverings according to the PCRs, have been included.

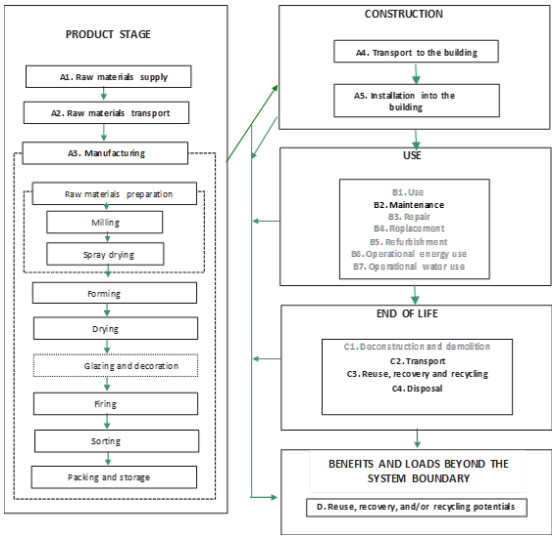


**Figure 4.** Boundaries of the system under study

### Raw materials supply and transport (A1 y A2)

The raw materials required for the ceramic tiles manufacturing are classified as: plastic raw materials and non-plastic or degreasing raw materials. In general, it can be accepted that the proportion among these two types of raw materials should be such that the mixture obtained is as plastic as necessary to correctly mould the piece, and at the same time, it confers the enough resistance on green tiles to process them. The key plastic raw materials are clays and kaolins. The more common non-plastic or degreasing raw materials are silica sands and alkaline feldspars. Other raw materials to consider are the residues of the own plant, these can be sludge or fired or unfired tile scrap, which are introduced into the raw materials milling stage.

Regarding glaze raw materials, the most used in the formulation are the following ones: quartz, kaolin, alkaline feldspars, nepheline, calcium carbonate, dolomite, zircon, wollastomita, calcined alumina and ceramic frits. Moreover, ceramic pigments prepared in an external company are also used, generally by oxide calcination and additives, (deflocculants, bindings) in order to maintain the optimal rheologic properties of the suspension which would assist the glazing operations and the obtention of the required aspect (texture and colour uniformity).

The ceramic frits are insoluble glasses, prepared in an external company by complete fusion of their original raw materials, called "frits". It is estimated that around 81% of the raw materials used in the glaze applied on earthenware tiles are submitted to fritting process.

The raw materials used have different origins according to their nature and properties. The raw materials coming from outside Spain are transported by freighter to the port of Castelló, and from there by truck to the spray-dried granule production plants. For sea transport the freighter selected is a transoceanic one, whose distance traversed depends on the origin of each case, whereas for road transport a 27t truck which meets the Euro6 standard has been chosen. All raw materials are transported in bulk, that is, they do not require packaging material, except the decoration materials which are transported in a 17,3t payload truck which meets the Euro5 standard, from the frits and glaze factory to MAINZU plants.

### Product mannufacturing (A3)

The raw material preparation of MAINZU is carried out by external companies. There, the origin and the proportion of raw materials is defined, adjusting it to the production process characteristics and the final performance required.

Once the spray – dried granule has been obtained, it is transported to MAINZU installations. The procedure is the following: the spry-dried powder is discharged in storage hoppers and with a feed system based in conveyor belts with weight control, this granule is sent to the forming stage by uniaxial dry pressing, carried

out by hydraulic or oleodinamic presses. This is the most indicated method to control the pressing cycle.

The pieces formed are placed in a continuous dryer to reduce their humidity, duplicating or triplicating their mechanical resistance, what allows their subsequent processing.

The tiles coming from the dryer are covered with one or more thin layers of engobe and glaze, which are applied over the ceramic body through spraying and digital glaze techniques. Then, they are decorated using different types of applications. This treatment is used to confer the product surface a series of technique and aesthetic features, as impermeability, ease of cleaning, brightness, colour, superficial texture, chemical and mechanical resistance.

Firing is the most important stage of the ceramic tiles production process, as it is when the pieces, previously shaped, suffer a fundamental modification of their features, resulting tough, water and chemical resistant product. The ceramic pieces are subject to a single firing single-deck roller kilns.

Once the quality controls are met, the classified pieces are packaged in primary cardboard packs and wood pallets. Finally, they are covered with film.

### 4.2. Construction process

#### Transport to the construction site (A4)

Product distribution is as follows: 18% in Spain, 20% in Europe, and 62% to the rest of the world. Three transport scenarios were estimated.

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).

| Parameter | Result |
|---|---|
| Fuel type and consumption | 0.0968l/m² diesel oil (27 t truck)<br>3,44E-4 l/m² fuel oil (freighter) |
| Distance | 35% in Spain (300 km)<br>17% to the rest of Europe (1390 km)<br>48% to the rest of the world (6250 km) |
| Capacity utilisation (including empty returns) | 85% in trucks<br>100% freighter |
| Bulk density of the transported products | 415,4 kg/m³ |
| Volume capacity utilisation factor (factor: =1 or < 1 or ≥ 1 for compressed or nested packaged products) | 0,25 |

**Table 5.** Transport to the construction site

#### 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. On the other hand, given the variety in formats of the pieces and different places and atmospheres in which the tiles can be installed, it is not possible to estimate a representative losses at this stage.

| Parameter | Result |
|---|---|
| Material 1: Cementitious adhesive | 1,5 kg |
| Use of fresh water | 0,375 $l^3$ |
| 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:<br>Cardboard: 95.8 g<br>Plastics: 23 g<br>Wood: 242.4 g |
| Output materials (specified by type) as a result of waste processing at the construction site | Incineration of cardboard:9.4 g<br>Recycled cardboard: 59.8g<br>Landfill disposal of cardboard: 26.8 g<br>Incineration of plastics:2.7 g<br>Recycled plastics: 12.9g<br>Landfill disposal of plastics: 7.4 g<br>Incineration of wood: 24.1 g<br>Recycled wood: 148.8 g<br>Landfill disposal of wood: 69.6 g |
| Direct emissions to ambient air, soil, and water | Not applicable |

**Tabl6 6.** Installation into the building

### 4.3. Use stage related to the operation and structure of the building (B1)

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 MAINZU, 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.

| Parameter | Result |
|---|---|
| Maintenance process | Washing thrice a year with water and detergent |
| Maintenance cycle | Not applicable |
| Ancillary materials for maintenance (e.g. cleaning agent) (specify materials) | Detergent: 1.34E-04 kg/cleaning |
| Desperdicio de material durante el mantenimiento (especificando el tipo) | Not applicable |
| Net fresh water consumption | 0.1 l/cleaning |
| Energy input during maintenance (e.g. vacuum cleaning), energy carrier type (e.g. electricity), and amount, if applicable and relevant | Not applicable |

**Table 7.** Use stage related to the building

### 4.4. 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), 75% of the construction and demolition waste is assumed to go to reuse, recovery, and recycling.

### Disposal (C4)

Twenty-five per cent of the product is sent to a controlled landfill.

| Parameter | Result |
|---|---|
| Collection process specified by type | 15,1 kg/m² collected with mixed construction and demolition waste |
| Recovery system specified by type | 10,6 kg for recycling |
| Disposal specified by type | 4,6 kg 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 6 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 |

**Table 8.** End of life stage

## 4.5. Benefits and loads outside the limits of the building system

### 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.

**Figure 5.** Installed product

# 5 Declaration of the envionmetal parameters of the LCA and LCI

The following tables include the averaged data of the LCA and LCI parameters.

The results associated with the ceramic tiles that have the minimum and the maximum environmental impacts are presented in Annexes I and II.

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| | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GWP** | 8,1 | 2,4E-01 | 3,1E-01 | | 1,9E-02 | | | | | | | 7,8E-02 | 0 | 5,7E-02 | -1,3E-01 |
| **ODP** | 1,5E-08 | 4,0E-17 | 4,3E-14 | | 1,1E-08 | | | | | | | 1,3E-17 | 0 | 5,8E-14 | -1,5E-09 |
| **AP** | 1,0E-02 | 2,3E-04 | 4,2E-04 | | 1,2E-04 | | | | | | | 6,1E-05 | 0 | 3,4E-04 | -3,5E-04 |
| **EP** | 1,9E-03 | 4,6E-05 | 1,1E-04 | NR | 2,9E-05 | NR | NR | NR | NR | NR | NR | 1,4E-05 | 0 | 4,6E-05 | -5,4E-05 |
| **POCP** | 9,6E-04 | 3,0E-05 | 4,3E-05 | | 3,9E-05 | | | | | | | 8,9E-06 | 0 | 2,7E-05 | -3,3E-05 |
| **ADPE** | 3,3E-05 | 1,9E-08 | 3,7E-07 | | 3,1E-08 | | | | | | | 6,0E-09 | 0 | 2,1E-08 | -5,0E-08 |
| **ADPF** | 104,8 | 3,3 | 1,3 | | 1,0E-01 | | | | | | | 1,1 | 0 | 7,4E-01 | -2,3 |

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

**Table 9.** Parameters describing environmental impacts as defined in EN 15804 standard

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| | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PERE** | 7,8 | 1,9E-01 | 3,2E-01 | | 4,3E-01 | | | | | | | 6,1E-02 | 0 | 9,0E-02 | -1,0 |
| **PERM** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **PERT** | 7,8 | 1,9E-01 | 3,2E-01 | | 4,3E-01 | | | | | | | 6,1E-02 | 0 | 9,0E-02 | -1,0 |
| **PENRE** | 106,9 | 3,3 | 1,5 | | 1,2E-01 | | | | | | | 1,1 | 0 | 7,7E-01 | -2,5 |
| **PENRM** | 0 | 0 | 0 | NR | 0 | NR | NR | NR | NR | NR | NR | 0 | 0 | 0 | 0 |
| **PENRT** | 106,9 | 3,3 | 1,5 | | 1,2E-01 | | | | | | | 1,1 | 0 | 7,7E-01 | -2,5 |
| **SM** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **RSF** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **NRSF** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **FW** | 8,1E-01 | 1,4E-02 | 1,0E-01 | | 9,0E-03 | | | | | | | 4,4E-03 | 0 | 4,3E-02 | -2,7E-01 |

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

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

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

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

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

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

**SM** *[MJ]* Use of secondary fuels

**RSF** *[MJ]* Use of renewable secondary fuels

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

**FW** *[m³]* Use of net freshwater resources

| | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HWD | 3,8E-03 | 0 | 0 | NR | 0 | NR | NR | NR | NR | NR | NR | 0 | 0 | 0 | 2,0E-04 |
| NHWD | 26,9 | 1,1E-02 | 4,6E-01 | | 9,0E-03 | | | | | | | 3,6E-03 | 0 | 7,3 | -4,0 |
| RWD | 6,6E-04 | 4,5E-06 | 6,2E-05 | | 1,1E-06 | | | | | | | 1,4E-06 | 0 | 1,1E-05 | -8,9E-08 |
| CRU | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| MFR | 0 | 0 | 9,6E-02 | | 0 | | | | | | | 0 | 8,6 | 0 | -4,4E-03 |
| MER | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| EE | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| EET | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |

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

**Table 11.** Parameters describing output flows and waste categories

# 6 Additional environmental informatio

## 6.1. Indoor air emissions

In the ceramic covering 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 stage use.

## 6.2. Release to soil and water

Ceramic coverings release no compounds into the soil or water during their use stage, because a completely inert product is involved that undergoes no physical. chemical. or biological transformations. is neither soluble nor combustible. and does not react physically or chemically or in any other way. is not biodegradable. and does no adversely affect to 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.

# ANNEX I. Declaration of the environmental parameters of the LCA and LCI for the format with minimum impacts

| | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GWP** | 7,0 | 2,1E-01 | 2,6E-01 | | 1,7E-02 | | | | | | | 6,7E-02 | 0 | 4,9E-02 | -1,2E-01 |
| **ODP** | 1,5E-08 | 3,4E-17 | 3,7E-14 | | 9,4E-09 | | | | | | | 1,1E-17 | 0 | 5,0E-14 | -1,3E-09 |
| **AP** | 9,6E-03 | 2,0E-04 | 3,6E-04 | | 1,0E-04 | | | | | | | 5,2E-05 | 0 | 2,9E-04 | -3,0E-04 |
| **EP** | 1,8E-03 | 4,0E-05 | 9,6E-05 | NR | 2,5E-05 | NR | NR | NR | NR | NR | NR | 1,2E-05 | 0 | 4,0E-05 | -4,7E-05 |
| **POCP** | 8,6E-04 | 2,6E-05 | 3,7E-05 | | 3,3E-05 | | | | | | | 7,6E-06 | 0 | 2,3E-05 | -2,8E-05 |
| **ADPE** | 3,4E-05 | 1,6E-08 | 3,2E-07 | | 2,6E-08 | | | | | | | 5,1E-09 | 0 | 1,8E-08 | -4,3E-08 |
| **ADPF** | 90,1 | 2,8 | 1,1 | | 8,6E-02 | | | | | | | 9,0E-01 | 0 | 6,4E-01 | -2,0 |

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

**Table I.1.** Parameters describing environmental impacts as defined in EN 15804 standard

EPD

tilebar

| | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PERE** | 7,3 | 1,6E-01 | 2,7E-01 | | 3,7E-01 | | | | | | | 5,3E-02 | 0 | 7,7E-02 | -0,9 |
| **PERM** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **PERT** | 7,3 | 1,6E-01 | 2,7E-01 | | 3,7E-01 | | | | | | | 5,3E-02 | 0 | 7,7E-02 | -0,9 |
| **PENRE** | 91,9 | 2,8 | 1,3 | | 9,9E-02 | | | | | | | 9,0E-01 | 0 | 7,0E-01 | -2,1 |
| **PENRM** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **PENRT** | 91,9 | 2,8 | 1,3 | | 9,9E-02 | | | | | | | 9,0E-01 | 0 | 7,0E-01 | -2,1 |
| **SM** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **RSF** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **NRSF** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **FW** | 7,4E-01 | 1,2E-02 | 8,7E-02 | | 7,7E-03 | | | | | | | 3,8E-03 | 0 | 3,7E-02 | -2,3E-01 |

NR

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

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

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

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

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

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

**SM** *[MJ]* Use of secondary fuels

**RSF** *[MJ]* Use of renewable secondary fuels

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

**FW** *[m³]* Use of net freshwater resources

| | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HWD** | 3,4E-03 | 0 | 0 | NR | 0 | NR | NR | NR | NR | NR | NR | 0 | 0 | 0 | 1,7E-04 |
| **NHWD** | 20,1 | 9,4E-03 | 4,0E-01 | | 7,7E-03 | | | | | | | 3,0E-03 | 0 | 6,2 | -3,4 |
| **RWD** | 5,9E-04 | 3,8E-06 | 5,3E-05 | | 9,8E-07 | | | | | | | 1,2E-06 | 0 | 9,0E-06 | -7,6E-08 |
| **CRU** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **MFR** | 0 | 0 | 9,2E-02 | | 0 | | | | | | | 0 | 8,2 | 0 | -4,2E-03 |
| **MER** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **EE** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| **EET** | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |

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

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

# ANNEX II. Declaration of the environmental parameters of the LCA and LCI for the format with maximum impacts

| | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GWP** | 9,6 | 3,2E-01 | 4,0E-01 | | 2,5E-02 | | | | | | | 1,0E-01 | 0 | 7,5E-02 | -1,8E-01 |
| **ODP** | 1,7E-08 | 5,2E-17 | 5,6E-14 | | 1,4E-08 | | | | | | | 1,7E-17 | 0 | 7,6E-14 | -1,9E-09 |
| **AP** | 1,1E-02 | 3,1E-04 | 5,5E-04 | | 1,6E-04 | | | | | | | 7,9E-05 | 0 | 4,4E-04 | -4,6E-04 |
| **EP** | 2,1E-03 | 6,1E-05 | 1,5E-04 | NR | 3,8E-05 | NR | NR | NR | NR | NR | NR | 1,8E-05 | 0 | 6,1E-05 | -7,1E-05 |
| **POCP** | 1,1E-03 | 3,9E-05 | 5,6E-05 | | 5,1E-05 | | | | | | | 1,2E-05 | 0 | 3,5E-05 | -4,3E-05 |
| **ADPE** | 3,8E-05 | 2,4E-08 | 4,9E-07 | | 4,0E-08 | | | | | | | 7,8E-09 | 0 | 2,7E-08 | -6,5E-08 |
| **ADPF** | 119,6 | 4,3 | 1,7 | | 1,3E-01 | | | | | | | 1,4 | 0 | 9,7E-01 | -3,0 |

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

**Table II.1.** Parameters describing environmental impacts as defined in EN 15804 standard

EPD

tilebar

| | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERE | 9,6 | 2,5E-01 | 4,2E-01 | | 5,6E-01 | | | | | | | 8,0E-02 | 0 | 1,2E-01 | -1,3 |
| PERM | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| PERT | 9,6 | 2,5E-01 | 4,2E-01 | | 5,6E-01 | | | | | | | 8,0E-02 | 0 | 1,2E-01 | -1,3 |
| PENRE | 122,3 | 4,3 | 1,9 | | 1,5E-01 | | | | | | | 1,4 | 0 | 1,0 | -3,2 |
| PENRM | 0 | 0 | 0 | NR | 0 | NR | NR | NR | NR | NR | NR | 0 | 0 | 0 | 0 |
| PENRT | 122,3 | 4,3 | 1,9 | | 1,5E-01 | | | | | | | 1,4 | 0 | 1,0 | -3,2 |
| SM | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| RSF | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| NRSF | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| FW | 9,6E-01 | 1,8E-02 | 1,3E-01 | | 1,2E-02 | | | | | | | 5,8E-03 | 0 | 5,6E-02 | -3,5E-01 |

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

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

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

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

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

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

**SM** *[MJ]* Use of secondary fuels

**RSF** *[MJ]* Use of renewable secondary fuels

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

**FW** *[m³]* Use of net freshwater resources

| | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HWD | 4,8E-03 | 0 | 0 | NR | 0 | NR | NR | NR | NR | NR | NR | 0 | 0 | 0 | 2,6E-04 |
| NHWD | 44,3 | 1,4E-02 | 6,1E-01 | | 1,2E-02 | | | | | | | 4,7E-03 | 0 | 9,5 | -5,3 |
| RWD | 8,4E-04 | 5,8E-06 | 8,1E-05 | | 1,5E-06 | | | | | | | 1,9E-06 | 0 | 1,4E-05 | -1,2E-07 |
| CRU | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| MFR | 0 | 0 | 1,4E-01 | | 0 | | | | | | | 0 | 12,6 | 0 | -6,4E-03 |
| MER | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| EE | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |
| EET | 0 | 0 | 0 | | 0 | | | | | | | 0 | 0 | 0 | 0 |

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

**Tabla II.3.** Parameters describing output flows and waste categories

# References


*[1]* Product Category Rules of ceramic coverings. GlobalEPD. AENOR. February 2016

*[2]* EN ISO 14025:2010

*[3]* EN 15804:2012+A1:2013

*[4]* GlobalEPD-RCP-002 Tile covering. Revision 1. AENOR. July 2018

*[5]* Life Cycle Assessment Study of porcelain earthenware tiles manufactured by MAINZU. Annex I, report number C202089 (Instituto de Tecnología Cerámica).

*[6]* EN 14411:2016

*[7]* ISO 13006:2018