DAPHabitat System

www.daphabitat.pt

ENVIRONMENTAL PRODUCT DECLARATION

[according to ISO 14025, EN 15804:2012+A1:2013 and EN 15942]

Registration Number: DAP 002:2019

ECO EPD registration number: 00000878

Porcelain tiles

ISSUE DATE: 2019-02-28 **VALID UNTIL: 2024-02-27**

PAVIGRÉS CERÂMICAS, S.A.

VERSION 1.1. EDITION JULY 2015

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1. GENERAL INFORMATION

1.1. The DAPHabitat System

Program operator:	Sustainable Construction Platform www.centrohabitat.net centrohabitat@centrohabitat.net
Address:	Departamento Engenharia Civil Universidade de Aveiro 3810-193 Aveiro
Email address:	deptecnico@centrohabitat.net
Telephone number:	(+351) 234 401 576
Website:	www.daphabitat.pt
Logo:	

1.2. EPD owner

Name of the owner:	Pavigrés Cerâmicas, S.A..
Production site:	Plant 1 (Pavigrés): Av. Alto das Domingas, 3780-244 – Aguim Plant 2 (Grespor): Av. Alto das Domingas, 3780-244 – Aguim Plant 3 (Cerev): Zona Industrial da Quinta, 3050-481 – Mealhada
Address (head office):	Pavigrés Cerâmicas, S.A., Av. Alto das Domingas, 3780-244 – Aguim
Telephone:	(+351) 231 510 600
E-mail:	expediente@pavigres.com
Website:	www.pavigres.com
Logo:	
Information concerning the applicable management Systems:	ISO 9001:2015 – Quality Management Systems ISO 14001:2015 – Environmental Management Systems
Specific aspects regarding the production:	NACE/CAE$_{Rev.3}$ n.º 23312 – Manufacture of ceramic tiles and flags

Organization's environmental policy:	PAVIGRÉS CERÂMICAS, S.A.: Mission: To create and produce ceramic wall and floor coverings that reinforces the prestige and confidence of PAVIGRES in the global market, ensuring the sustainability and development of the Group. Policy: To assume, as a fundamental vector for its success, the permanent focus on the Client, translated into the constant concern of anticipating and responding to market expectations. Present global and integrated solutions of ceramic flooring and wall covering, with products that are presented on the market for their recognized quality and aesthetic value. This Policy aligns and develops in the following areas: • Satisfy customers; • Reward shareholders; • Protect employees; • Dignify the relationship with suppliers; • Protect the environment by minimizing environmental impact and promoting pollution prevention through the implementation of good practices; • Provide the necessary resources to meet the established objectives and targets, and create conditions for possible investments in new projects focused on the relevant stakeholders, in order to promote the financial consolidation of PAVIGRÉS; • Continuously improve environmental performance and its Integrated Quality and Environmental Management System. Objectives of the IQEMS: • Improve economic/ financial results; • Increase the range of satisfied customers and promote their loyalty; • Promote competence and employee satisfaction; • Monitor Supplier performance and cultivate/ inspire a relationship of honesty and trust with him; • Comply with the regulatory, legal and other requirements applicable to its activity; • Protect the environment and prevent pollution.

1.3. Information concerning the EPD

Authors:	1. Centro Tecnológico da Cerâmica e do Vidro 2. PAVIGRÉS CERÂMICAS, S.A.
Contact of the authors:	1. CTCV materials: habitat | iParque – Parque Tecnológico de Coimbra - Lote 6 | 3040-540 Antanhol - Portugal (T) +351 239 499 200 Marisa Almeida: marisa@ctcv.pt 2. Pavigrés Cerâmicas, S.A., Av. Alto das Domingas, 3780-244 - Aguim (T) +351 231 510 600; E. qualidade@pavigres.com
Emission date:	2019-02-28
Registration date:	2019-03-20
Registration number:	DAP 002:2019
Valid until:	2024-02-27
Representativity of the EPD (location, manufacturer, group of manufacturers):	EPD of one (1) product class, produced in three (3) industrial plants belonging to one (1) sole producer (Pavigrés Cerâmicas, S.A.).
Where to consult explanatory material:	www.pavigres.com
Type of EPD:	EPD from cradle to gate (A1-A3)

1.4. Demonstration of the verification

External independent verification, accordingly with the standard ISO 14025:2009 and EN 15804:2012+A1:2015

Certification Body	**Verifier**
(CERTIF – Associação para a Certificação)	(Ricardo Mateus)

1.5. EPD Registration

Program Operator
(Plataforma para a Construção Sustentável)

1.6. PCR of reference

Nome	Emission date	Number of registration on the data base	Version	Valid until
PCR: Basic module for construction products and services	September 2015	PCR-mb001	Version 2.0.	January 2021
PCR: Floor covering	February 2014	RCP001:2014	Version 1.0	February 2019
PCR: Wall covering	February 2014	RCP002:2014	Version 1.0	February 2019

1.7. Information concerning the product/product class

Identification of the product:

Porcelain ceramic tiles for wall and floor covering

Illustration of the product:

Brief description of the product:

Porcelain tiles produced by the PAVIGRÉS CERÂMICAS, S.A group, used as floor and wall coverings, both indoors and outdoors in residential and public areas. This product is impermeable and has a high mechanical resistance, being available in the market a panoply of aesthetic and dimensional options, as much in visual effects as of texture and colours.

In this EPD the results are given per unit mass (1 kg) of the product. However, since the production process is the same, regardless of the thickness or shape of the products, it is possible to convert these results to other units - m^2, for example - using conversion factors, according to the weights indicated in the following table:

Table 1: Conversion factors

Thickness (mm)	Weight (kg/m^2)	Thickness (mm)	Weight (kg/m^2)
7,6	17,1	9,8	22
8,3	18,5	10,5	24,4
8,5	19,1	11	25,2
8,8	19,6	12	26,4
9,2	21,2	14	31,9
9,5	21,3	--	--

NOTE: Table of average weights per m^2 (kg/m^2), depending on the thickness of the product. For more precise information on the weights per unit area of each reference, please consult the weights and packaging table on PAVIGRÉS website.

Main technical characteristics of the product:

Table 2: Technical characteristics

Standard required by the norm	Mean value of tolerances	Test norm
Dimensional characteristics	Linear dimensions ± 0,2% Orthogonality ± 0,3% Straightness of edges ± 0,2% Flatness ± 0,2% Thickness ± 3%, except 60x60 cm: ± 0,4 mm	NP EN ISO 10545-2
Water absorption	≤ 0,08%	NP EN ISO 10545-3

	Breaking strength in N	(7,5mm)≥1500N (7,8mm)≥1600N (8,3mm)≥1800N (8,7mm)≥1900N (9,0mm)≥2000N (9,2mm)≥2100N	(9,5mm)≥2100N (10,0mm)≥2200N (10,5mm)≥2600N (11,0mm)≥3300N (12,0mm)≥3700N (14,0mm)≥5000N	NP EN ISO 10545-4
	Rupture modulus N / mm2	≥45 n/mm² | ≥460 kg/cm² v. Medium Grespor: 52 N/mm²		
	Deep scratch resistance	130 mm³		NP EN ISO 10545-6
	Resistance to surface abrasion	Indicated for each ref.		NP EN ISO 10545-7
	Linear thermal dilatation (x10⁻⁶ k⁻¹)	≤7		NP EN ISO 10545-8
	Resistance to thermal shock	Resistant		NP EN ISO 10545-9
	Frost resistance	Resistant		NP EN ISO 10545-12
	Resistance to hair cracking	Guaranteed		NP EN ISO 10545-11
	Resistance to household products and swimming-pool additives	Guaranteed		NP EN ISO 10545-13
	Resistance to low/ high concentrations of acids and alkalis	To be confirmed		NP EN ISO 10545-13
	Resistance to staining	Glazed tiles: guaranteed Unglazed tiles: ≥ class 2		NP EN ISO 10545-14
	Cadmium and lead release	Below the limit of quantification: < 0,2 mg Pb/l < 0,02 mg Cd/l		NP EN ISO 10545-15
	Anti-slip features (slipperiness)	To be confirmed		DIN 51130 DIN 51097 ENV 12633 BS7976-2

(see link of the technical datasheets with all data:
http://pavigres.com/ficheiros/caracteristicas_tecnicas/caractersticas-tcnicas.pdf)

Description of the products' application:

Porcelain tiles for the following applications:

- Floor covering
- Wall covering
- Indoor covering
- Outdoor covering
- Areas and residential buildings
- Areas and public buildings
- Areas and industrial buildings

Reference service life:

Not specified.

Placing on the market / Rules of application in the market / Technical rules of the product:

EN 14411:2012
EN ISO 10545
DIN 51130
DIN 51097
ENV 12633
BS 7976-2

Quality control:

According to the technical standards of the product.

Special delivery conditions:

Not applicable

Components and substances to declare:

Not applicable

History of the LCA studies:

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2. ENVIRONMENTAL PERFORMANCE OF THE PRODUCT

2.1. Calculation rules of the LCA

Declared unit:	1 kg of porcelain tiles for wall and floor covering (including packaging)
Functional unit:	--
System boundaries:	EPD from cradle to gate
Criteria for the exclusion:	According to paragraph 6.3.5 of EN 15804, the exclusion criterion for unitary processes is 1% of the total energy consumed and 1% of the total mass of the inputs, paying particular attention not to exceed a total of 5% of energy and mass flows excluded in the product step. The following cases were not considered in this study, as they may fall under the exclusion criteria: • Environmental loads associated with the construction of industrial infrastructures and the manufacture of machinery and equipment; • Environmental loads relating to infrastructure (vehicle and road production and maintenance) for the transport of pre-products; • Long term emissions.
Assumption and limitations:	For processes over which producers have no influence or specific information, such as the extraction of raw materials, generic data from the Ecoinvent v3.3 databases were used. The dataset used to model the production of electricity and natural gas was adapted to the national reality. The electric mix was updated for the year 2016 through information from the National Energy Networks (REN), the Energy Services Regulatory Authority (ERSE) and the General Board of Energy and Geology (DGEG) in order to obtain more current results regarding the environmental impacts generated by the electricity grid in Portugal. The natural gas process was modelled according to the information provided by the DGEG Energy Report in Portugal (2015), regarding the countries where the importation comes from. The environmental impacts indicated in this EPD are a weighted average of all Pavigrés, Grespor and Cerev porcelain tiles products fabricated in 2016, based on the production of each industrial plant.
Quality and other characteristics about the information used in the LCA:	The production data collected correspond to the year 2016 and are in line with reality. The generic data used belong to the Ecoinvent v3.3 databases and meet the quality criteria (age, geographical and technological coverage, plausibility, etc.) of generic data.
Allocation rules:	The allocation rules adopted were based on the annual production in each of the three establishments of Pavigrés Cerâmicas, S.A.
Comparability of EPD for construction products:	The EPDs for construction products and services may not be comparable if they are not produced in accordance with EN 15804 and EN 15942 and in accordance with the comparability conditions determined by ISO 14025.

2.1.1. Flow diagram of input and output of the processes

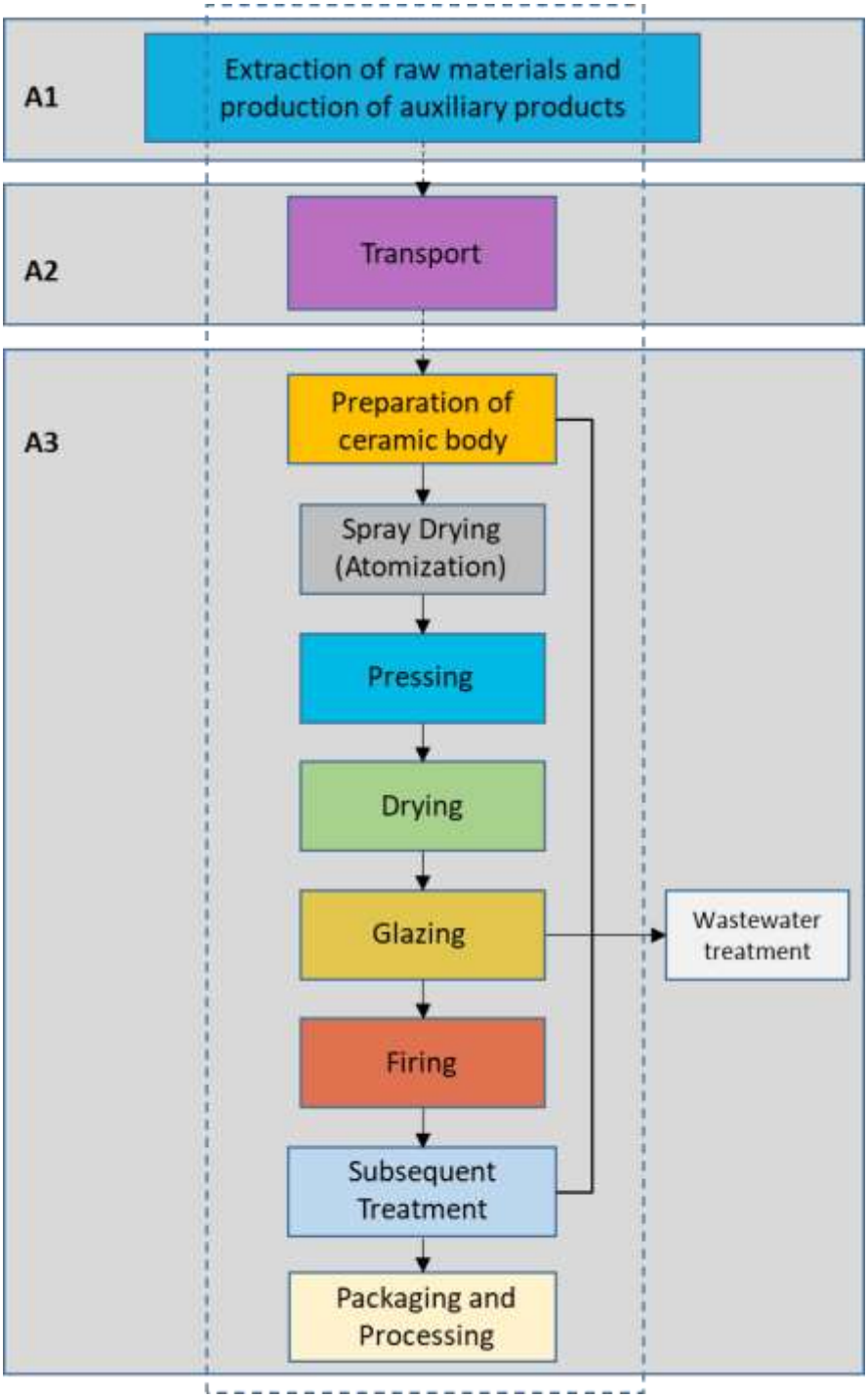

Figure 1 - Life cycle stages of porcelain tiles (A1-A3).

This DAP evaluates the A1-A3 stage of the products life cycle, including the stage of extraction and production of all products and materials used as raw material, transportation of these materials from the suppliers to the industrial plants of PAVIGRÉS and the processing of these materials to the production of final products, including their packaging.

A1 - Extraction and processing of raw materials: this step includes the extraction and eventual processing of raw materials

A2 – Transport: Raw materials and auxiliary materials come from truck or truck, boat and truck again.

A3 – Production: This stage includes the design and development, storage of raw materials, pulp preparation, forming (by pressing), drying, glazing or decoration, firing and choice, subsequent treatment (e.g. polishing), packaging and storage.

Pavigrés Cerâmicas, S.A., (in Pavigrés, Grespor and Cerev production plants) is dedicated to the production of ceramic tiles (flooring and wall coverings, in porcelain and non-porcelain stoneware, glazed and unglazed) by spray dried powder pressing, followed by drying and firing. Natural raw materials, processed raw materials and additives are used, in which the main ones are: clays, feldspars, sands and kaolins.

Hard raw materials (sand, feldspar, etc.) are subject to grinding and milling, and the clay is subjected to suspension (wet mixing); subsequently, are mixed and homogenized (storage and agitation) constituting the final composition of the ceramic body.

The ceramic body in the form of casting slip is subsequently coloured and atomized (spray drying process) to form the ceramic powder which, after homogenization, is pressed - shaped by pressing. The raw pressed tiles are subjected to a quick drying cycle, to eliminate their residual moisture and, finally, to be subjected to the firing process, which will give them all the final physical and chemical characteristics.

The fuel used in the spray drying, drying and firing processes is Natural Gas.

2.1.2. Description of the system boundaries

(✓= included; ✖ = module not declared)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Use	Maintenance	Repair	Replacement	Rehabilitation	Operational energy use	Operational water use	De-constructions, demolition	Transport	Waste processing	Disposal	Re-use, recovery, recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
✓	✓	✓	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖

2.2. PARAMETERS DESCRIBING ENVIRONMENTAL IMPACTS

		Global warming potential; GWP kg CO_2 equiv.	Depletion potential of the stratospheric ozone layer; ODP kg CFC 11 equiv.	Acidification potential of soil and water, AP kg SO_2 equiv.	Eutrophication potential, EP kg $(PO_4)^{3-}$ equiv.	Formation potential of tropospheric ozone, POCP kg C_2H_4 equiv.	Abiotic depletion potential for non-fossil resources kg Sb equiv.	Abiotic depletion potential for fossil resources MJ, P.C.I.
Raw material supply Transport Manufacturing	**A1 – A3**	6,27E-01	8,90E-08	2,37E-03	2,01E-04	1,19E-04	1,19E-06	9,15E+00
Total	**Total**	6,27E-01	8,90E-08	2,37E-03	2,01E-04	1,19E-04	1,19E-06	9,15E+00

LEGEND:

Product stage

NOTE: LHV - lower heating value.
Values expressed by declared unit (1 kg).

2.3. Parameters describing resource use

		Primary energy						Secondary materials and fuels, and use of water			
		EPR MJ, P.C.I.	RR MJ, P.C.I.	TRR MJ, P.C.I.	EPNR MJ, P.C.I.	RNR MJ, P.C.I.	TRNR MJ, P.C.I.	MS kg	CSR MJ, P.C.I.	CSNR MJ, P.C.I.	Net use of fresh water m^3
Raw material supply Transport Manufacturing	**A1 – A3**	9,05E -01	2,14E-01	1,12E+00	9,41E+00	0,00E+00	9,41E+00	0,00E+00	0,00E+00	0,00E+00	1,58E-03
Total	**Total**	9,05E -01	2,14E-01	1,12E+00	9,41E+00	0,00E+00	9,41E+00	0,00E+00	0,00E+00	0,00E+00	1,58E-03

Values expressed by declared unit (1 kg)

LEGEND:

Product stage

EPR = use of renewable primary energy excluding renewable primary energy resources used as raw materials;
RR = use of renewable primary energy resources used as raw materials;
TRR = total use of renewable primary energy resources (EPR + RR);
EPNR = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
RNR = use of non-renewable primary energy resources used as raw materials;
TRNR = total use of non-renewable primary energy resources (EPRN + RNR);
MS = use of secondary material;
CSR = use of renewable secondary fuels;
CSNR = use of non-renewable secondary fuels.

2.4. Other environmental information describing different waste categories

		Hazardous waste disposed kg	Non-hazardous waste disposed kg	Radioactive waste disposed ** kg
Raw material supply Transport Manufacturing	**A1 –A3**	5,34E-04	1,97E-04	1,14E-05
Total	**Total**	5,34E-04	1,97E-04	1,14E-05

Values expressed by declared unit (1 kg)

LEGEND:

Product stage

** The radioactive waste component does not come from the activity of PAVIGRÉS (A3). It is a component derived from the upstream activities (A1 and A2), namely from the production of electricity.

2.5. Other environmental information describing output flows

Parameters	Units*	Results
Components for re-use	kg	N/A
Materials for recycling	kg	2,59E-01
Materials for energy recovery	kg	0,00E+00
Exported energy	MJ by energy carrier	N/A

* expressed by functional unit or declared unit (kg)

3. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

This EPD evaluates only the production stage of the product, integrating steps A1 to A3. Thus, the following scenarios of the construction step (modules A4 and A5), step of use (B1 to B7) and end of life step (C1 to C4), are not applicable.

3.1. Additional environmental information concerning the release of dangerous substances

According to Decree-Law no. 183/2009, of 10th August, which re-establishes the legal regime for landfilling, the leaching tests carried out on PAVIGRÉS fired broken ware show that the broken ware have parameters for inert landfill.

Other additional information:

Environmental protection

PAVIGRÉS environmental management is based on the ISO 14001:2015 standard on environmental management systems, on a principle of continuous improvement of environmental performance.

The company adopts an approach of environmental protection and pollution prevention, both in terms of production processes and products, trying to reduce the consumption of resources. Raw materials, energy and water are vital components of all processes.

PAVIGRÉS reuses a series of wastes and by-products inherent to its manufacturing process, such as dust from extractors and broken ware from processes before firing, into the production process, promoting circular economy.

It also recirculates almost half of the water after treatment in its ETARI (industrial wastewater treatment plant) for the production process.

At the energy level it also recovers hot air from the cooling zone of the furnaces to other processes (e.g. drying and spray drying).

Protection of the environment, reduction of waste production, efficient use of natural resources and reduction of environmental risks is paramount. The activities related to the activities of monitoring and operational control of its environmental aspects and impacts are managed according to the environmental management system according to ISO 14001: 2015.

Continuous improvement is a priority in the areas of energy efficiency, energy efficiency projects, opportunity assessment, energy policy development and implementation and reduction of greenhouse gas emissions.

Occupational Health and Safety

Samplings and analyses are carried out in the area of employee health and safety, as well as the safety of working conditions. Existing and potential risks are assessed and measures taken to reduce them to acceptable levels.

REFERENCES

✓ **Ecoinvent database v3.3** (2016). (www.ecoinvent.org)

✓ **EN 15804:2012+A1:2015** Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products;

✓ **EN 15942:2011** Sustainability of construction works – Environmental product declarations – Communication format business-to-business.

✓ **Energy Services Regulatory Authority (ERSE)** – Special Regime Production (PRE) (2016) (in http://www.erse.pt/pt/desempenhoambiental/prodregesp/2016/Paginas/2016.aspx)

✓ **General Board of Energy and Geology (DGEG)** – Energy in Portugal Report (2015)

✓ **General Board of Energy and Geology (DGEG)** – Monthly Data of Electrical Energy (2016). (in http://www.dgeg.gov.pt?cr=15125)

✓ **Instruções Gerais do Sistema DAPHabitat**, Version 1.0, March 2013 (in www.daphabitat.pt);

✓ **National Energy Networks (REN)** – Information Centre – Monthly Statistics (2016). (in http://www.centrodeinformacao.ren.pt/PT/InformacaoExploracao/Paginas/EstatisticaMensal.aspx)

✓ **NP ISO 14025:2009** Rótulos e declarações ambientais – Declarações ambientais Tipo III – Princípios e procedimentos;

✓ **Regras para a Categoria de Produto (RCP) – Modelo base para produtos e serviços de construção**. DAPHabitat System. Version 2.0, September of 2015 (in www.daphabitat.pt);

✓ **Regras para a Categoria de Produto (RCP) – Revestimento de Paredes.** Wall covering. RCP002:2014. DAPHabitat System. Version 1.0, February 2014 (in www.daphabitat.pt);

✓ **Regras para a Categoria de Produto (RCP) – Revestimento de Pavimento.** Floor covering. RCP001:2014 DAPHabitat System. Version 1.0, February 2014 (in www.daphabitat.pt);