ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration Revigrés

Publisher Institut Bauen und Umwelt e.V. (IBU)

Declaration number EPD-REV-20240006-CCC1-EN

Issue date 22/03/2024 Valid to 21/03/2029

Glazed and unglazed porcelain tiles Revigrés



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General Information Glazed and unglazed porcelain tiles Revigrés Programme holder Owner of the declaration IBU - Institut Bauen und Umwelt e.V. Revigrés Apartado 1 Barrô 3754 Águeda Hegelplatz 1 10117 Berlin Germany Portugal **Declaration number** Declared product / declared unit EPD-REV-20240006-CCC1-EN Glazed and Unglazed Porcelain Tiles/1 m² of ceramic tiles This declaration is based on the product category rules: Scope: Ceramic tiles and panels, 01/08/2021 The EPD applies to 1m² of glazed and unglazed porcelain tiles, produced (PCR checked and approved by the SVR) by Revigrés, in its facilities located in Barrô - Águeda - Aveiro - Portugal. The results presented correspond to an average EPD of the Revigrés. The owner of the declaration shall be liable for the underlying information Issue date and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences. 22/03/2024 The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as EN 15804. Valid to 21/03/2029 Verification The standard EN 15804 serves as the core PCR Independent verification of the declaration and data according to ISO 14025:2011 internally X externally Dipl.-Ing. Hans Peters (Chairman of Institut Bauen und Umwelt e.V.) (Managing Director Institut Bauen und Umwelt e.V.) (Independent verifier)



Product

Product description/Product definition

The Revigrés glazed and unglazed porcelain tiles are produced combining technological innovation with good environmental practices.

They are dry pressed and characterized by technical specifications (high mechanical strength and resistance to wear, chemical and stains), and it is fully vitrified (at temperature of over 1200 °C) acquiring extremely low water absorption, no more than 0.5%, with consequently frost resistance, making it suitable for outdoor installation.

In porcelain tiles, each series can have different dimensions, colours, textures and finishes:

- Edge: natural and rectified;
- Surface: such as matte, glossy, non-slip, softened and polished.

and thanks to its superior technical characteristics, allows the Designer to satisfy all project requirements. For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a Declaration of Performance taking into consideration /EN 14411:2012 Ceramic tiles — Definitions, classification, characteristics, evaluation of conformity and marking/ and the CE-marking.

For the application and use the respective national provisions apply.

Application

Ceramic Porcelain tiles can be applied both indoor and outdoor areas:

- · indoor/outdoor covering
- · floor/wall covering
- commercial buildings
- · residential buildings
- · industrial buildings
- floors of outdoor facilities such as gardens, terraces, pool sides and recreational areas

Technical Data

The Revigrés porcelain tiles comply with requirements of standard of *EN 14411:2012* Group Bla (dry-pressed with water absortion E<0.5%), and *ISO 10545* standards For each product, the data provided in the Declaration of Performance applies.

Most relevant technical characteristics:

Constructional data

Name	Value	Unit
Deviation of mean thickness from manufacturing thickness (ISO 10545-2)	± 0.5% max ± 0.5 mm	
Water Absorption (ISO 10545-3)	< 0.1	% (W/W)
Bending Strength thickness < 7.5 mm (ISO 10545-4)	> 700	N
Bending Strength thickness ≥ 7.5 mm (ISO 10545-4)	≥ 1300	N
Rupture Modulus (ISO 10545-4)	> 45	N/mm ²
Impact resistance (ISO 10545-5)	Test method available	
Deep abrasion (unglazed tiles) (ISO 10545-6)	< 120	mm ³
Resistance to surface abrasion (glazed tiles) (ISO 10545-7)	PEI GROUPS 1-2-3-4-5	
Cracking Resistance (glazed tiles) (ISO 10545-11)	Resistant	
Coefficient of Linear Thermal expansion (with atmospheric temperature up to 100 °C) (ISO 10545-8)	≤ 8,0x10^-6	/°C
Resistant to frost (ISO 10545-12)	Resistant	
Resistance to thermal shock (ISO 10545-9)	Resistant	-
Resistance to Acids and low concentrations Bases (ISO 10545-13)	from LA to LB	
Resistance to Acids and high concentrations Bases (ISO 10545-13)	from HA to HB	-
Resistance to household chemicals ans swimming pool water additives (ISO 10545-13)	Min. class B	
Resistance to staining (ISO 10545-14)	Min. class 3	
Antislip Resistance - pendulum test value (ENV 12633)	To be confirmed case by case	
Antislip Resistance - shod ramp test (DIN EN 16165 annexe b)	To be confirmed case by case	
Antislip Resistance - barefoot ramp test (DIN EN 16165 annexe a)	To be confirmed case by case	-
Antislip Resistance - pendulum test value - 4S (DIN EN 16165 annexe c)	To be confirmed case by case	1
Antislip Resistance (DCOF) (ANSI A	To be confirmed case	
326.3)	by case	

 Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to EN 14411:2012 (Group Bla GL or UGL), Ceramic tiles - Definition, classification, characteristics, assessment and verification of constancy of performance and marking.

Base materials/Ancillary materials

Ceramic tiles are mainly made of raw natural material such as clay, kaolin, feldspar, silica sand. The finishing product includes frits, pigments, binders, and other auxiliary



substances/additives like dispersant, pigment, binder and rheological additives.

Name	Value	Unit
Clay	40 - 43	%
Kaolin	5 - 7	%
Feldspar	46 - 49	%
Silica sand	5 - 8	%
Others	0 - 2	%

Reference service life

The life cycle duration was based on product standard *EN* 14411 and annexe H of *NF EN* 15804+A2+ AC/CN.

According to *EN* 17160, PCR of this product, which is based on *EN* 14411:2012 (Ceramic tiles - Definitions, classification, characteristics, conformity assessment and marking), the reference life of the product is estimated at 50 years (Table H.2 — List of default DVRs by product category). No repair, renewal or replacement is necessary during this lifetime.

LCA: Calculation rules

Declared Unit

1 m² of glazed and unglazed porcelain tiles.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	m ²
Grammage	19.8	kg/m ²
conversion factor [Mass/Declared Unit]	0.0505	-
Layer thickness	0.0083	m

System boundary

Type of the EPD: cradle to grave.

Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: Global

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. The Ecoinvent v3.7.1 background database has been used to calculate the EPD results.

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The product does not contain biogenic carbon.

Packaging material contains biogenic carbon that is accounted for in this section.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.185	kg C

Note: 1 kg biogenic Carbon is equivalent to 44/12 kg of CO₂.

The following information refers to the declared modules and is the basis for calculations or can be used for further calculations. The indicated values refer to the declared unit.

Transport to the building site (A4)

Name	Value	Unit
Transport distance	1390	km
Capacity utilisation (including empty runs)	< 100	%
Gross density of products transported	270	kg/m ³

This scenario is based on EN 17160 and IBU PCR - Part B.

Installation into the building (A5)

Name	Value	Unit
Auxiliary (cement mortar)	3.3	kg
Water consumption	0.0008	m ³
Material loss	0.595	kg
Wood pallets	0.529	kg
Paper waste	0.043	kg
Plastic waste	0.023	kg

This scenario is based on EN 17160 and IBU PCR - Part B.

Use or application of the installed product (B1) see section 2.12 "Use"

Name	Value	Unit

According to *EN 17160* and *IBU PCR - Part B* ceramic tiles are intrinsically inert and therefore do not have environmental impacts during their use to be addressed in module B1.

Maintenance (B2)

Name	Value	Unit
Information on maintenance	Cleaning 52 times per year (residential use)	-
Maintenance cycle	2600	Number/RSL
Water consumption	0.26	m ³
Detergent consumprtion	0.53	I

In case a **reference service life** according to applicable ISO standards is declared then the assumptions and in-use conditions underlying the determined RSL shall be declared. In addition, it shall be stated that the RSL applies to the reference conditions only.

The same holds for a service life declared by the manufacturer. Corresponding information related to in-use conditions needs not be provided if a service life taken from the list of service life by *BNB* is declared.

Reference service life

Name	Value	Unit
Reference service life (according to ISO 15686-1, -2, -7 and -8)	50	а

End of life (C1-C4)

Name	Value	Unit	
Waste for recycling	16.19	kg	
Waste for landfilling	6.94	kg	



This scenario is based on EN 17160 and IBU PCR - Part B.

Reuse, recovery and/or recycling potentials (D), relevant scenario information

After the demolition/deconstruction stage, ceramic tiles can be crushed and then used in a range of different applications such as describer in *EN 17160* and *IBU PCR - Part B*:

 recycled ceramic aggregates which can be integrated as a partial substitute of natural aggregate in hotmix

- asphalt (Silvestre et al., 2013);
- recycled ceramic aggregates can be used in the construction of landfills;
- recycled ceramic aggregates can be utilized in the construction of subbased courses on secondary roads

In this case, the modelling was carried out based on the replacement of natural aggregates (70%).

lame	Value	Unit
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LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			_	ruction s stage		Use stage					End of life stage				Benefits and loads beyond the system boundaries	
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
A1	A2	A3	A4	A5	B1	B2	В3	B4	B5	В6	B7	C1	C2	C3	C4	D
Χ	Х	Х	Х	Х	Х	Х	MNR	MNR	MNR	MND	MND	Χ	Х	Х	Х	X

RESULTS (OF THE LC	A - ENVIRO	ONMENTAL	. IMPACT a	ccording t	o EN 1580	4+A2: 1 m2	2 Glazed ar	nd unglaze	d porcelair	ı tiles
Parameter	Unit	A1-A3	A4	A5	B1	B2	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq	1.35E+01	3.72E+00	1.77E+00	0	8.3E-01	0	1.34E-01	1.04E-01	5.77E-02	-2.85E-02
GWP-fossil	kg CO ₂ eq	1.39E+01	3.72E+00	1.11E+00	0	8.09E-01	0	1.34E-01	1.03E-01	5.76E-02	-2.67E-02
GWP- biogenic	kg CO ₂ eq	-4.8E-01	2.97E-03	6.61E-01	0	2.04E-02	0	1.07E-04	1.59E-03	1.67E-04	-1.76E-03
GWP-luluc	kg CO ₂ eq	2.46E-02	2.82E-05	8.28E-04	0	4.46E-04	0	1.01E-06	5.02E-05	1.29E-06	-1.57E-05
ODP	kg CFC11 eq	2.85E-06	8.64E-07	1.13E-07	0	8.99E-08	0	3.11E-08	1.88E-08	1.3E-08	-4.95E-09
AP	mol H ⁺ eq	4.17E-02	7.33E-03	3.36E-03	0	5.54E-03	0	2.64E-04	9.14E-04	5.18E-04	-2.28E-04
EP- freshwater	kg P eq	1.89E-04	2.03E-06	1.65E-05	0	3.05E-05	0	7.3E-08	2.51E-06	6.11E-08	-6.29E-07
EP-marine	kg N eq	1.22E-02	1.22E-03	9.67E-04	0	7.5E-04	0	4.4E-05	3.66E-04	2.26E-04	-9.1E-05
EP-terrestrial	mol N eq	9.96E-02	1.36E-02	9.46E-03	0	8.22E-03	0	4.9E-04	4.02E-03	2.48E-03	-1E-03
POCP	kg NMVOC eq	4.12E-02	4.81E-03	2.96E-03	0	3.66E-03	0	1.73E-04	1.1E-03	6.73E-04	-2.77E-04
ADPE	kg Sb eq	7.01E-04	1.58E-07	2.1E-05	0	3.73E-07	0	5.68E-09	4.6E-09	2.76E-09	-7.65E-09
ADPF	MJ	2.03E+02	5.27E+01	9.79E+00	0	2.83E+01	0	1.9E+00	1.57E+00	8.04E-01	-5.46E-01
WDP	m ³ world eq deprived	4.5E+00	-1.12E-02	1.6E-01	0	1.16E+01	0	-4.02E-04	4.84E-03	1.29E-04	-8.2E-03

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m2 Glazed and unglazed porcelain tiles

or column times												
Parameter	Unit	A1-A3	A4	A5	B1	B2	C1	C2	C3	C4	D	
PERE	MJ	3.67E+01	7.76E-02	1.87E+00	0	5.65E-01	0	2.79E-03	8.58E-02	1.46E-02	-1.99E-01	
PERM	MJ	2.22E-04	0	2.19E-01	0	0	0	0	0	0	0	
PERT	MJ	3.67E+01	7.76E-02	2.09E+00	0	5.65E-01	0	2.79E-03	8.58E-02	1.46E-02	-1.99E-01	
PENRE	MJ	2.22E+02	5.6E+01	1.06E+01	0	3.02E+01	0	2.01E+00	1.67E+00	8.59E-01	-5.7E-01	
PENRM	MJ	2.37E-05	0	0	0	0	0	0	0	0	0	
PENRT	MJ	2.22E+02	5.6E+01	1.06E+01	0	3.02E+01	0	2.01E+00	1.67E+00	8.59E-01	-5.7E-01	
SM	kg	6.48E-01	0	0	0	0	0	0	0	0	0	
RSF	MJ	0	0	0	0	0	0	0	0	0	0	
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	
FW	m ³	1.13E-01	1.05E-03	6.53E-03	0	2.72E-01	0	3.76E-05	4.04E-04	4.75E-05	-4.81E-03	

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources; see as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m2 Glazed and unglazed porcelain tiles

Parameter	Unit	A1-A3	A4	A5	B1	B2	C1	C2	C3	C4	D	
HWD	kg	2.21E-03	1.4E-04	7.07E-05	0	1.43E-05	0	5.03E-06	2.99E-06	2.11E-06	-7.93E-07	
NHWD	kg	1.83E+00	2.21E-03	2.94E-01	0	2.47E-02	0	7.93E-05	2.42E+00	6.93E+00	-6.5E-04	
RWD	kg	3.94E-04	3.82E-04	3.37E-05	0	1.88E-05	0	1.38E-05	1.12E-05	5.86E-06	-5.01E-06	
CRU	kg	0	0	0	0	0	0	0	0	0	0	
MFR	kg	2.53E-02	0	6.6E-01	0	0	0	0	1.62E+01	0	0	
MER	kg	7.39E-03	0	1.68E-01	0	0	0	0	0	0	0	
EEE	MJ	1.55E+00	0	3.2E+01	0	0	0	0	0	0	0	



EET	MJ	0	0	0	0	0	0	0	0	0	0

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m2 Glazed and unglazed porcelain tiles

Parameter	Unit	A1-A3	A4	A5	B1	B2	C1	C2	C3	C4	D
РМ	Disease incidence	9.5E-07	2.14E-07	5.29E-08	0	5.17E-08	0	7.71E-09	8.47E-08	4.04E-08	-6.05E-09
IR	kBq U235 eq	3.18E-01	2.32E-01	3.46E-02	0	2E-02	0	8.36E-03	8.9E-03	3.55E-03	-6.34E-03
ETP-fw	CTUe	1.42E+02	2.11E+01	1.01E+01	0	1.26E+01	0	7.58E-01	5.92E-01	3.05E-01	-2.68E-01
HTP-c	CTUh	6.87E-09	2.78E-10	3.33E-10	0	2.77E-09	0	9.99E-12	1.06E-11	6.26E-12	-2.06E-11
HTP-nc	CTUh	2.15E-07	3.3E-08	1.16E-08	0	2.76E-08	0	1.19E-09	6.84E-10	4.21E-10	-2.22E-10
SQP	SQP	1.58E+02	1.68E-01	1.23E+01	0	1.37E+00	0	6.04E-03	4.75E-01	2.96E-01	-9.3E-01

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator "Potential Human exposure efficiency relative to U235". This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators "abiotic depletion potential for non-fossil resources", "abiotic depletion potential for fossil resources", "water (user) deprivation potential, deprivation-weighted water consumption", "potential comparative toxic unit for ecosystems", "potential comparative toxic unit for humans – cancerogenic", "Potential comparative toxic unit for humans – not cancerogenic", "potential soil quality index". The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

References

ANSI A 326.3

ANSI A326.3-2021. Dynamic Coefficient Of Friction (DCOF) Of Hard Surface Flooring Materials

CRP

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ISO 10545-3

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ISO 10545-5

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ISO 10545-6

ISO 10545-6:2010. Ceramic tiles – Part 6: Determination of resistance to deep abrasion for unglazed tiles



ISO 10545-7

ISO 10545-7:1996. Ceramic tiles – Part 7: Determination of resistance to surface abrasion for glazed tiles

ISO 10545-8

ISO 10545-8:2014. Ceramic tiles – Part 8: Determination of linear thermal expansion

ISO 10545-9

ISO 10545-9:2013. Ceramic tiles – Part 9: Determination of resistance to thermal shock

ISO 10545-11

ISO 10545-11:1994. Ceramic tiles – Part 11: Determination of crazing resistance for glazed tiles

ISO 10545-12

ISO 10545-12:1995. Ceramic tiles – Part 12: Determination of frost resistance

ISO 10545-13

ISO 10545-13:2016. Ceramic tiles – Part 13: Determination of chemical resistance

ISO 10545-14

ISO 10545-14:2015. Ceramic tiles – Part 14: Determination of resistance to stains

ISO 13006

ISO 13006: 012. Ceramic tiles - Definitions, classification, characteristics and marking, 2nd edn. International Organization for Standardization, USA

Regulation (EU) No. 305/2011

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SimaProSimaPro/ SimaPro LCA Software. Pré Consultants. the Netherlands. www.presustainability.com

The literature referred to in the Environmental Product Declaration must be listed in full.Standards already fully quoted in the EPD do not need to be listed here again.

The current version of PCR Part A and PCR Part B of the PCR document on which they are based must be referenced.





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