ENVIRONMENTAL PRODUCT DECLARATION

Product Name:
Technical porcelain stoneware tiles medium thickness 9.5 mm

Site Plant:
Via Statale 467 n.119 – 42013 Casalgrande (RE)

In compliance with standards ISO 14025 and EN 15804+A2:2019

Program Operator	EPDItaly
Publisher	EPDItaly
Declaration number	*EPD 003 CIPA GRES*
Registration number	EPDITALY0805
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1. GENERAL INFORMATION

EPD Owner	CIPA GRES S.p.A. Via Statale 467 n.119 – 42013 Casalgrande (RE)
Contacts for EPD information	Dott. Alessandro Pugnaghi
Program operator	EPDITALY (www.epditaly.it) via Gaetano De Castillia n. 10 - 20124 Milano, Italia
Product name	PORCELAIN STONEWARE TILES
Plant involved in the declaration	CIPA GRES S.p.A. Via Statale 467 n.119 – 42013 Casalgrande (RE) www.cipagres.it
Short product desciption	Technical porcelain stoneware tiles medium thickness 9.5 mm
Application Area	The ceramic tiles produced by CIPA GRES and covered by this EPD are intended for residential, commercial, and industrial use.
CPC code	37370
PCR (Title, version, publication or update date)	EN 15804:2012+A2:2019 is the framework reference for PCR. PCR ICMQ-001/15 rev3
EPDItaly Regulations (version, publication or update date)	EPDItaly Regulations, rev. 6 dated 30/10/2023
Project Report LCA	EPD based on a verified LCA tool: LCA tool creator per Ceramic Tile V6 [(27/11/2023) - DB version 2023.2]
Independent Check	Independent verification of the declaration and data according to ISO 14025:2010. ☐ Internal ☑ External Third-party verification performed by: ICMQ S.p.A., via Gaetano De Castillia n. 10 - 20124 Milano, Italia. Accredited by Accredia.
Comparability	Environmental declarations published within the same product category, but from different programmes, may not be comparable. In particular, EPDs for construction products may not be comparable if they do not comply with EN 15804:2012+A2:2019.
Accountability	The EPD Owner exempts EPDItaly from any non-compliance with environmental legislation. The declaration holder shall be responsible for the information and supporting evidence. EPDItaly declines all responsibility regarding the information, data, and results provided by the EPD Owner for the life cycle assessment.
Technical support	Sphera https://www.sphera.com

2. THE COMPANY

CIPA GRES S.p.A., a long-standing company in the ceramic district, has been operating since 1967 in the production of unglazed (UGL) acid-resistant technical porcelain stoneware tiles. The development policy implemented in recent years has the specific objective of producing high-tech porcelain stoneware tiles that respect the values of protecting the environment in which we live, intended for residential, commercial, and industrial settings. One of the company's main strengths is the ability to design and develop a product based on customer needs and intended use, ranging from the industrial, chemical, naval, commercial, logistics, mechanical, and food sectors to the outfitting of public spaces. A decisive factor in eliminating the risk of slipperiness in specific environments is the use of anti-slip floors with a structured surface, CIPA GRES S.p.A, of which the company offers a wide range. CIPA GRES S.p.A. is proud to bring a product with great production flexibility and quality to the whole world, expressing the best of "Made in Italy" through wide ranges of colors, surfaces, and the use of the most advanced technologies and raw materials.

Cipa Gres S.p.A. products comply with the following standards:

- /EN 14411:2016/ Ceramic tiles - Definitions, classification, characteristics, evaluation of conformity and marking
- /ISO 10545-1÷15/ methods for test
- /CEN/ Internal Regulation Part 4 Certification; Keymark Scheme Rules for Ceramic Tiles
- /DIN EN 16165: 2022 Annex B/ Testing of floor coverings. Determination of the anti-slip properties. Workrooms and fields of activities with slip danger, walking method-ramp test;
- /DIN EN 16165: 2022 Annex A / ramp method barefoot test;
- /BS EN 16165:2021 Annex C/ pendulum test;
- /ASTM Internatiinal/: a US standardization body, acronomy of American Society for Testing and Materials International;
- /UNE EN 16165:2022 Annex C/ pendulo test;
- /QB32 Marque QB/ Annexe technique et administrative de la certification QB: Carreaux pour revêtements de sol;
- / DEVL1104875A/ French packaging legislation requires us to present information on the level of emissions of volatile substances into indoor air, which pose a risk of inhalation toxicity, on all our cartons. The ceramic tiles are always classifies as A+, since they do not release any toxic substance into the environment.
- /CNCA-C21-01:2014/ Implementation rules for porcelain tiles; La marque CCC subdivise les produits en deux classes selon le pourcentage de radioactivité : classe A et B
- /2014/C 259/01 Regulation (EU) No 305/2011/ of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.
- /SASO ISO-13006 (SQM)/ A mark approved by SASO indicating that the establishment has an effective that ensures producing a product complies with the technical regulations and the Saudi Standards.;

3. GOAL AND SCOPE OF EPD

The entire product life cycle is considered (EPD Type: cradle-to-grave) and the modules described below are declared in this EPD:

*Modules **A1-A3** include the processes providing energy and materials for the system (A1), transportation to the factory gate (A2), manufacturing processes, and waste treatment (A3). EMISSION FACTORS FOR ENERGY CONSUMPTION (A1-A3): The emission factors (DB version 2023.2) of the datasets used to calculate the impact of energy consumption in the production stage (A1-A3) for the Climate Change – Total indicator have been attached to the Project Short Report. For data confidentiality reasons, the emission factors used in the study cannot be made public, as stipulated in point 5.3 of Sphera's 'Terms & Conditions'.*

*Module **A4** includes the transport from the production site to the customer or to the point of installation of the tiles.*

*Module **A5** It considers all tile installation stages (such as adhesive consumption) and packaging waste treatment (recycling, incineration, disposal). Credits resulting from energy recovery are declared in Module D. In this stage, a 6.5% ceramic material loss was considered.*

*Module **B2** it includes tile cleaning. Water supply and tile cleaning detergent are taken into consideration, including wastewater treatment.*

*Module **C1** it concerns the demolition and dismantling process of the tiles from the building. It is not considered relevant in terms of environmental impacts.*

*Module **C2** it considers the transport of the discarded tile to a recycling or disposal process.*

*Module **C3** it considers every process (collection, crushing, etc.) appropriately for the recycling of the tiles.*

*Module **C4** It includes all landfill disposal processes, including pretreatment and management of the disposal site.*

*Module **D** it includes the benefits derived from all net flows in the end-of-life stage that leave the product boundary system after having passed the end-of-waste stage. The loads resulting from the incineration of packaging (A5) and the resulting energy credits (electricity and thermal energy) are declared within module D.*

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END-OF-LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction and demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
A1	**A2**	**Size A3**	**Size A4**	**Size A5**	**B1**	**Level B2**	**B3 (English)**	**B4**	**B5**	**B6 (English)**	**B7 (English)**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

MND: MODULE NOT DECLARED

EPD TYPE:

The EPD type is an average EPD for the product 'Porcelain stoneware surfaces - tiles' manufactured at the CIPA GRES S.p.A. plant located in Via Strada Statale 467 n.119, Casalgrande (RE). All production and sales data refer to the year 2023.
According to PCR ICMQ-001/15 rev. 3, the LCA study and the related EPD are 'cradle-to-grave'. The modules included are A1, A2, A3, A4, A5, B1-B7, C1, C2, C3, C4, and D. All manufacturing activities and the production of packaging/auxiliaries are included in module A3, while energy production and input materials are in A1. Transport to customers (A4) and installation (A5) are included along with end-of-life scenarios (benefits and loads included according to module D).

GEOGRAPHICAL VALIDITY:

The performance has been calculated with reference to the company sites. The reference market is global.

DATABASE: Managed LCA Content (GaBi Database) (version 2023.2)

SOFTWARE: LCA for Expert (GaBi) (version 10.7)

4. DETAILED PRODUCT DESCRIPTION

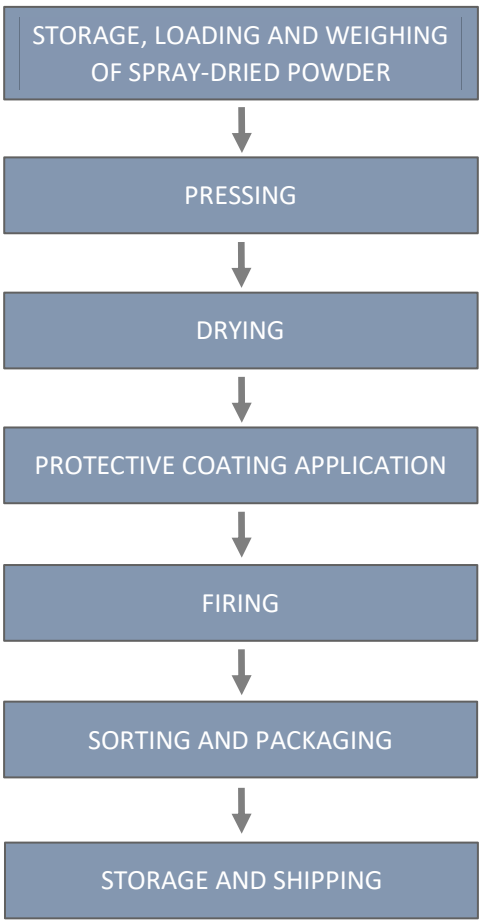
MANUFACTURING PROCESS DESCRIPTION:

Entry, storage and entry into production of raw materials:
The first stage of the production process consists of the arrival and storage of raw materials in silos. In the case of Cipa Gres, the production cycle begins with the purchase and storage of spray-dried powder for porcelain stoneware production, which is the powder obtained from the spray-drying of the slip. The spray-dried clays used in this cycle are purchased from external companies, unloaded into hoppers by trucks, and then transported via conveyor belts to storage silos. In addition to the spray-dried powder, the company also acquires raw materials for glazes from external sources; these are mixed with water and applied in the glazing line. The spray-dried materials arrive at the plant by truck and are unloaded into the feeding hoppers of the respective storage silos. Glazes also arrive by truck and are contained within 1-cubic-meter plastic containers. Only an engobe is produced internally, to be applied to the back of the tiles to prevent adhesion to the kiln rollers during firing.

Manufacturing:
From the silos, the spray-dried powder is withdrawn via conveyor belts and loaded onto the press feeding towers by means of bucket elevators; the system of feeding towers, or technological towers, allows for optimal and efficient sieving, dosing, and mixing of the powders. Subsequently, the prepared spray-dried body is fed into the press loading hoppers. A dosing box ensures uniform distribution into the molds. The pressing operation takes place in two relatively short consecutive phases: in the first, the plunger descends slowly and steadily to allow for the expulsion of almost all air and the regular, uniform arrangement of all particles within the cavity; in the second, the plunger rises briefly only to descend again with maximum power to compress and bond these particles together. The pressed material is automatically sent to specific dryers where, through heat injection, it loses residual moisture. During this phase, various types of glazes are applied to the raw ceramic support to provide the finished product with the desired aesthetic characteristics after the final firing stage. Glazes are distributed onto the tile surface using different types of surface applications: spray application with airbrushes, centrifugal disc nebulization, or screenprinting decoration. The pressed material is collected in crates and stored in a warehouse. This allows for continuous kiln feeding during the night, as well as on pre-holidays and holidays. Finally, the raw support obtained from the previous operations undergoes firing, a thermal process that leads to the vitrification (greification) of the ceramic product; firing is currently carried out in three kilns.

Packaging:
The fired tiles are subsequently sorted to define their quality characteristics, such as type, geometric dimensions, aesthetic features, surface appearance, etc. Semi-automatic sorting lines are used for these operations, and the sorted products are packed in cardboard boxes, which are then transported to the palletizing area where they are arranged on pallets.

Shipping warehouse:
Pallets are wrapped with heat-shrinkable polypropylene hoods and then shipped to various customers.



HEALTH AND SAFETY OF WORKERS:

The company, in compliance with the requirements of current safety legislation, specifically Legislative Decree 81/08 as amended and the State-Regions Agreement, provides workers with information and training regarding all identified risks, particularly chemical, physical, biological risks, and all risks typical of the ceramic sector, as reported in the Risk Assessment Document (DVR), created in accordance with regulations and sector guidelines.

ENVIRONMENTAL PROTECTION:

Cipa Gres is authorized to operate under the Integrated Environmental Authorization (AIA) and is subject to the Emission Trading System (ETS) regulations as an OPT-OUT facility. The current requirements and monitoring plan outline the actions that the company constantly undertakes for the protection of resources and environmental matrices; all phases of the production cycle characterized by atmospheric emissions are equipped with suitable pollutant abatement systems. In particular, particulate matter emissions are reduced through fabric bag filters, while fumes from kiln firing are treated with hydrated lime—all systems characterized by maximum efficiency. Energy consumption, linked to greenhouse gas emissions, is periodically monitored by maintaining plant efficiency, opting for the acquisition of low-consumption equipment, and streamlining gas and electricity withdrawals. Cipa Gres also produces electricity through a photovoltaic system and a co-generator dedicated to the integration of thermal energy for the dryers.

All production waste, such as green and fired tile scraps, sludge, and suspensions from washing wastewater, is delivered to an authorized external company and destined for recovery.

As highlighted in the annual report prescribed by the Integrated Environmental Authorization, the company complies with the procedures and parameters indicated by the sector's Best Available Techniques (BAT), ensuring constant protection of the environment as a whole.

Technical data: " describe the product under consideration". Technical data, technical specifications, requirements, and reference standards.

Name	Value	Unit
Surface quality according to ISO 10545-2 § 7	Compliant	-
Water absorption according to ISO 10545-3	≤ 0,05	%
Breaking strength according to ISO 10545-4	>35	N/mm^2
Modulus of rupture according to ISO 10545-4	1300	N
Deep abrasion resistance – Unglazed tiles according to. Compliant with the standard ISO 10545-6	120 - 150	mm^3
Resistance to surface abrasion – Glazed tiles according to ISO 10545-7	n.r	-
Coefficient of linear thermal expansion according to ISO 10545-8	≤ 9	mk^{-1}
Thermal shock resistance according to ISO 10545-9	Resistant	-
Crazing resistance according to ISO 10545-11, glazed tiles	n.r	-
Frost resistance according to ISO 10545-12	Resistant	-
No-slip property (class A, B or C) according to CEN/TS 16165	A - C	
Bond strength/adhesion according to EN 12004	Resistant	-
Impact resistance according to ISO 10545-5	Resistant	-
Reaction to fire NO testing (CWT)	A1 /A1 FL	-
Resistance to low and high concentrations of acids and alkalis according to ISO 10545-13	Resistant	-
Resistance to household chemicals and swimming pool salts according to ISO 10545-13	UA	-
Stain resistance according to ISO 10545-14	Class 5	-
Release of lead and cadmium – Glazed tiles according to ISO 10545-15	n.r	-
Moisture expansion according to ISO 10545-10	Resistant	-

BASE MATERIALS / ANCILLARY MATERIALS:

Main raw materials for ceramic tiles:

- Clays 37,59 %
- Feldspars 39,90 %
- Sands 21,64 %
- Pigments (colourant) 0,87 %

PRODUCT PROCESSING/ INSTALLATION

Tiles are fixed to wall and floor surfaces using various materials and quantities, such as dispersion and cementitious adhesives and mortars, sealants, or liquid-applied membranes. During installation, no emissions occur, and no risks to health or the environment arise from ceramic tile installations.

RELEVANT EFFECTS DURING USE

Fire: In accordance with the /EN 13501-1:2007+A1:2009/ standard, ceramic tiles can be classified as fire resistance class A1 as they are non-flammable.

It has been demonstrated that in the event of a fire, the ceramic tile covering reduces the heat input to them and thus the risk of collapse.

Water: Ceramic tiles are insoluble materials and do not react.

ENVIRONMENT AND HEALTH DURING USE

Ceramic is intrinsically inert, chemically stable and therefore, during the use stage, it does not emit pollutants or substances harmful to the environment and health, such as VOCs and Radon.

DECLARED UNIT AND REFERENCE FLOW

The declared unit is 1 m^2 of ceramic tiles for wall and floor coverings for 1 year. The mass of the considered surface is 21.3 kg, while the thickness is 9.5 mm. In accordance with this thickness, the following sizes are produced:

- 40x40 cm
- 30X60 cm

REFERENCE SERVICE LIFE (RSL)

The durability of tiles is generally over 50 years (BNB 2011). Furthermore, according to the U.S. Green Building Council, the service life of tiles could coincide with the service life of the building itself. Therefore, 60 years represent an alternative for tiles. The reported results consider the use of tiles for 1 year; by multiplying the B2 values by 50 or 60, the B2 values for 50 or 60 years are obtained. No RSL has been defined according to the ISO 15686 standard.

MECHANICAL DESTRUCTION

Ceramic tiles can be mechanically crushed, but no harmful environmental impacts are expected.

RE-USE PHASE

After the demolition and deconstruction stage, ceramic tiles can be crushed and then used in a variety of applications, such as concrete aggregates or road construction.

DISPOSAL

According to the European Waste Catalogue (EWC), ceramic tile waste belongs to group 17 'Construction and demolition waste', tiles and ceramics (code: 17 01 03).

5. LCA RESULTS

The following tables show the LCA (Life Cycle Assessment) results for each of the seven declared thicknesses. Basic information on all declared modules is available in chapter 3.

Results can be converted for kg using the following conversion factor: 1/21.3

Environmental impact indicators for 1m² of ceramic tiles – THICKNESS 9.5 mm – 21.3 Kg/m²														
Indicator	Unit	A1	A2	A3	A4	A5	B1	B2	B3/ B7	C1	C2	C3	C4	D
GWP total	kg CO_2-eq.	6.99	1.1	6.05	0.866	3.68	0	0.0118	0	0.0174	0.081	0.0479	0.122	-0.227
GWP fossil	kg CO_2-eq.	6.97	1.05	7.03	0.833	2.35	0	0.0089	0	0.0167	0.0774	0.048	0.121	-0.226
GWP biogenic	kg CO_2-eq.	0.0213	0.0419	-0.976	0.033	1.33	0	0.00285	0	0.000762	0.00353	-0.000496	0.00034	-0.000886
GWP luluc	kg CO_2-eq.	0.000913	6.24E-005	0.00102	4.79E-005	0.00108	0	1.34E-006	0	1.05E-006	4.94E-006	0.000368	0.000382	-0.000132
ODP	kg CFC-11-eq.	3.48E-011	3.37E-013	2.3E-011	9.4E-014	7.64E-012	0	4.19E-014	0	1.96E-015	9.27E-015	8.18E-014	3.13E-013	-1.82E-012
AP	mole di H+-eq.	0.0482	0.00741	0.0257	0.0047	0.00763	0	1.55E-005	0	8.35E-005	0.000116	0.000255	0.000873	-0.000425
EP - freshwater	kg P eq.	5.84E-006	2.73E-007	2.82E-006	2.02E-007	9.2E-006	0	3.56E-006	0	4.02E-009	1.9E-008	1.66E-007	2.48E-007	-6.25E-007
EP - marine	kg N eq.	0.00386	0.00254	0.00289	0.00119	0.00145	0	1.75E-005	0	3.97E-005	4.64E-005	0.000117	0.000225	-0.000139
EP - terrestrial	mole di N eq.	0.0458	0.028	0.0319	0.0131	0.0165	0	4.59E-005	0	0.000434	0.000511	0.00129	0.00248	-0.0015
POCP	kg NMVOC eq.	0.0138	0.00589	0.00981	0.00336	0.00384	0	1.94E-005	0	0.000112	0.000111	0.000318	0.00068	-0.000432
ADPE	kg Sb eq.	6.34E-005	1.36E-008	1.04E-007	1.01E-008	6.97E-006	0	3.96E-010	0	2.06E-010	9.72E-010	5.24E-008	5.69E-009	-1.77E-008
ADPF	MJ	199	15.2	7.13	11.9	22.4	0	0.198	0	0.239	1.13	0.962	1.64	-4.72
WDP	M^3 World EQ.	0.785	0.0043	0.242	0.00195	0.181	0	0.00156	0	4E-005	0.000189	0.00951	0.0135	-0.0162
Caption	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													

Resource use indicators for 1 m² of ceramic tiles – THICKNESS 9.5 mm – 21.3 Kg/m²														
Indicator	Unit	A1	A2	A3	A4	A5	B1	B2	B3/B7	C1	C2	C3	C4	D
PERE	[MJ]	17.2	0.16	13.9	0.0738	0	0	0.0242	0	0.00154	0.00728	0.0895	0.267	-1.12
PERM*	[MJ]	0	0	0.455	0	-0.455	0	0	0	0	0	0	0	0
PERT	[MJ]	17.2	0.16	14.4	0.0738	5.04	0	0.0242	0	0.00154	0.00728	0.0895	0.267	-1.12
PENRE	[MJ]	199	15.3	7.07	11.9	22.4	0	0.198	0	0.24	1.13	0.965	1.64	-4.72
PERNM*	[MJ]	0	0	0.0766	0	-0.0766	0	0	0	0	0	0	0	0
PENRT	[MJ]	199	15.3	7.14	11.9	22.4	0	0.198	0	0.24	1.13	0.965	1.64	-4.72
SM	[kg]	0	0	0.148	0	0.0096	0	0	0	0	0	0	0	18.6
RSF	[MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	[MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	[kg]	0.0268	0.000221	0.00708	8.67E-005	0.00576	0	5.62E-005	0	1.79E-006	8.47E-006	0.000275	0.000414	-0.000964
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used 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 = Net use of fresh water.													

***** *In order to balance the values of the PENRM and PERM associated with the use of packaging, the values in module A5 (end-of-life of packaging) are negative.*

Wastes input/ output flows for 1m² of ceramic tiles – THICKNESS 9.5 mm – 21.3 Kg/ m²														
Indicator	Unit	A1	A2	A3	A4	A5	B1	B2	B3/ B7	C1	C2	C3	C4	D
HWD	[kg]	8.11E-008	5.75E-011	3.93E-009	2.37E-011	5.85E-009	0	1.03E-011	0	4.41E-013	2.08E-012	-2.5E-012	3.57E-011	-1.91E-010
NHWD	[kg]	0.833	0.00157	0.115	0.00118	1.61	0	0.00604	0	2.39E-005	0.000113	0.000254	8.2	-0.774
RWD	[kg]	0.00201	0.000101	0.000164	1.92E-005	0.000363	0	4.49E-006	0	4E-007	1.89E-006	1.29E-005	1.87E-005	-0.000228
CRU	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	0.0223	0	0.029	0	0	0	0	0	19.1	0	0
MER	[kg]	0	0	0	0	0.22	0	0	0	0	0	0	0	0
Caption	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; AEE = Exported thermal energy													

Biogenic carbon content of product and packaging for 1 m² of ceramic tiles THICKNESS 9.5 mm - 21.3 Kg/m²														
Indicator	Unit	A1	A2	A3	A4	A5	B1	B2	B3/B7	C1	C2	C3	C4	D
Biog. C in packaging	[kg]	0	0	0.0122	0	-0.0122	0	0	0	0	0	0	0	0
Biog. C in product	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
Caption	C in packaging = Biogenic carbon content in packaging; C in product = Biogenic carbon content in product													

Additional indicators (PM, IR, ETF-fw, HTP-c, HTP-nc, and SQP) have been calculated and can only be viewed in the /Background Report/.

Disclaimer for EN 15804+A2: additional indicators

(2) The results of environmental impact indicators ADP, WDP, ETP-fw, HTP-c, HTP-nc, SQP shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

6. CALCULATION RULES

REFERENCE FLOW:

Name	Value	Unit
Declared unit	1	m^2
Weight	21.3	kg/m^2
Conversion factor in 1 kg	0.047	-

ASSUMPTIONS:

Modules A5 to C4 are scenarios based on average data included in the PCR created by the 'European Ceramic Tile Manufacturers Federation' /CET PCR 2014/ and subsequently implemented in the IBU programme operator's PCRb 'Ceramic tiles and panels'."

CUT-OFF CRITERIA:

None

DATA QUALITY:

The validity period of the background data from the Sphera database is between 2019 and 2023. Most of the information (energy and water consumption, polluting emissions, spray-dried powders, and ceramic production) is measured or calculated directly at the company level and declared in the Italian IPPC document called AIA, which is specific and verified for each plant involved in this study. Carbon dioxide emissions (related to carbonate oxidation) are collected through ETS (Emission Trading System) reporting.

Detailed data were obtained not only for raw material mixtures (collected with company-specific primary data) but also for other raw materials used.

The overall data quality can be considered satisfactory.

PERIOD UNDER REVIEW:

The primary data collected in the study refer to the reference year 2023.

ALLOCATION:

Energy and material supplies have been allocated to the product based on the annual production of ceramic tiles for each thickness. No further allocations have been applied within the subsequent module.

VARIABILITY ANALYSIS:

The average EPD covers the ceramic tile formats produced by CIPA GRES SPA that fall within the values specified in section 3. All products considered in the EPD fall within an impact variation of ±10% for the following indicators:

- Global warming potential - total
- Acidification
- Photochemical ozone formation, human health
- Resource use, minerals and metals
- Resource use, fossils

- Total use of renewable primary energy resources (PERT)
- Total use of non-renewable primary energy resources (PENRT)

7. SCENARIOS

The following technical information on the declared modules and related scenarios are based on average data, according to the 'European Ceramic Tile Manufacturers Federation' and subsequently implemented in the IBU programme operator's PCRb 'Ceramic tiles and panels'.

Transport (A4):

The LCA practitioner must justify the transport scenario used (if different from the default scenario). For transport distances of less than 300 km, it is assumed that the trucks perform the return journey empty, whereas for distances greater than 300 km, they will return full of other goods, so the return journey is not included in the inventory of the analyzed system.

Name	Quantity	Unit
Truck with domestic destination having a capacity of 27 tons (20.5% of tiles sold)	300	km
Truck with European destination having a capacity of 27 tons (48.5% of tiles sold)	1390	km
Transoceanic transport (31% of tiles sold)	6520	km

Installation into the building (A5):

Three options are defined for the installation stage, in which different materials can be used.

- Option 1: adhesives, mortar and water;
- Option 2: mortar and polysulphide dispersion adhesives;
- Option 3: cementitious adhesives (different quantities for different tile sizes).

These considerations are based on average data provided by various ceramic tile manufacturers in Europe. In this EPD, it is assumed that the tiles are installed with cementitious adhesive (Option 3).

Option 3 (large format tiles)	Quantity	Unit
Cementitious adhesives	6	Kg

For the treatment of packaging waste, an average European scenario is used, taken from 'Eurostat, 2020'. Therefore, the end-of-life consists of recycling, energy recovery, and landfill for plastic and paper, and re-use, energy recovery, and landfill for wood.
The considered ceramic material loss is 6.5%.

Maintenance (B2):

Only stage B2, the maintenance stage, is considered in terms of impact generation. Throughout its service life, the ceramic cladding must be cleaned regularly, to a greater or lesser extent, depending on the type of building (residential, commercial, etc.) in which it is installed. If the surface is dirty or greasy, cleaning agents such as detergents or bleach can be added. In this way, the consumption of water and disinfectant chemicals has been taken into account.

Name	Value	Unit
Water Consumption	0.1	l
Detergent	0.2	Ml
Floor tile Maintenance cycle	52	Number/LS
Wall tile Maintenance cycle	4	Number/LS

End-of-life (C1-C4):

C1: This module considers the demolition stage by accounting for an excavator (100 kW) with a diesel consumption of 1.72E-04 per kg of product, including all emissions associated with the fuel combustion process.

C2: Ceramic tile demolition waste is transported from the construction site to a container or a treatment plant by truck, considering an average distance of 20 km. The return journey is included in the system. An average distance of 30 km from the container or treatment plant to the final destination is also considered.

C3-C4: The table below shows the end-of-life stage.

Name	Value	Unit
Recycling percentage (C3)	70	%
Landfill percentage (C4)	30	%

Benefits and loads beyond the product system boundary (D):

Module D includes credits resulting from the recycling of product and packaging materials, as well as energy credits from the thermal recovery of packaging.

8. ENVIRONMENT AND HEALTH DURING USE

Ceramics are intrinsically inert and chemically stable; therefore, during the use stage, they do not emit substances that are polluting or harmful to the environment and health, such as VOCs and Radon.

9. OTHER ADDITIONAL ENVIRONMENTAL INFORMATION

Biogenic carbon content

Biogenic carbon content for 1 m² of product	Kg
In Packaging	0,0122
In product	0

Additional environmental parameters relating to the Minimum Environmental Criteria (CAM) of Ministerial Decree 23 June 2022, paragraph 2.5.10.1 'Hard floorings'.

The finished product from CIPA GRES SPA complies with the Minimum Environmental Criteria (CAM) listed below, developed within the national Green Public Procurement (GPP) strategy and established by the Decree of 23 June 2022 by the Ministry of Ecological Transition (now Ministry of the Environment and Energy Security).
The new decree replaces the previous Minimum Environmental Criteria published in the Ministerial Decree of 11 October 2017 and came into force on 04/12/2022.
As of 01-01-2024, for ceramic tiles, the criteria included in Decision 2021/476, which establishes the criteria for awarding the European Union ecological quality mark (EU Ecolabel) to hard covering products, are considered.

COMMON CRITERIA

1.1 Extraction of industrial and construction minerals: Cipa Gres S.p.A. requires all raw material suppliers involved in extraction activities to provide the activity authorization, the environmental restoration plan, an environmental impact assessment, and a map with the geographic coordinates of the site.
Specifically, the company META SPA, with its operational headquarters in Via Sacco e Vanzetti, 48 Fiorano Modenese (MO), a raw material supplier for CIPA GRES SPA, complies with the CAM requirements concerning "Extraction of raw materials" according to Commission Decision 2021/476 of 16 March 2021, which establishes the criteria for awarding the EU Ecolabel to hard covering products, as stated in the DNV Inspection Report.
1.2a Restricted substances: The product has been manufactured using supplied chemicals or materials that do not contain substances of very high concern (SVHC) included in the candidate list in accordance with Article 59 of Regulation (EC) N.1907/2006, in concentrations greater than 0.10% (w/w).

1.2b Substances classified according to Regulation (EC) N.1272/2008: The product has been manufactured using supplied chemicals or materials that do not contain substances in concentrations greater than 0.10% (w/w) that have been assigned the following hazard classes, hazard categories, and related hazard statement codes in accordance with Regulation (EC) N.1272/2008.

– Group 1 hazards: Category 1A or 1B, carcinogenic, mutagenic and/or toxic for reproduction (CMR): H340, H350, H360, H360F, H360D, H360FD, H360Fd, H360Df.
– Group 2 hazards: CMR, category 2: H341, H351, H361, H361f, H361d, H361fd, H362; Hazardous to the aquatic environment, category 1: H400, H410; Acute toxicity, categories 1 and 2: H300, H310, H330; Aspiration hazard, category 1: H304; Specific target organ toxicity (STOT), category 1: H370, H372.

– Group 3 hazards: Hazardous to the aquatic environment, categories 2, 3, and 4: H411, H412, H413; Acute toxicity, category 3: H301, H311, H331; Specific target organ toxicity, category 2: H371, H373. The above does not apply to substances used containing crystalline silica, with hazard statements H372 and H373; for these substances, the handling and dosing instructions provided in the supplier's Safety Data Sheets (SDS) are followed.
Furthermore, safety instructions regarding dust exposure during cutting operations performed by installers are provided with the product.

1.3 VOC Emissions: Ceramic tiles are known as inert materials free of harmful emissions.

1.4 Fitness for use: CIPA GRES products are CE marked in accordance with the EN 14411 technical standard and EU Regulation N.305/2011. Cipa Gres has established procedures for quality control and complaint management.

1.5 User information: Information regarding technical characteristics, installation, cleaning, and maintenance of the product is available in the catalog and on the group's website.

SPECIFIC CRITERIA FOR CERAMIC PRODUCTS

a. Fuel consumption: The specific fuel energy consumption for atomization, drying, and firing processes does not exceed the relevant limits shown in the table.

b. CO_2 Emissions: Specific CO_2 emissions associated with fuel use and process emissions resulting from raw material decarbonation during atomization, drying, and combustion processes do not exceed the relevant limits shown in the table.

c. Process water consumption: The activities at the CIPA GRES plant do not involve any discharge of water into the environment. Production wastewater, consisting of line-washing water, is conveyed via under-line grates to a specific tank, from which it is transported by tanker truck to another plant and fully recycled there for spray-dried powder production. The overall system is therefore a closed-loop type, supporting a zero-liquid discharge (ZLD) system.

d. Air Pollutant Emissions: Specific emissions of Particulate Matter (Dust), HF, and NOX to air associated with the production of Cipa Gres products do not exceed the relevant limits shown in the table.

e. Wastewater management: Activities at the CIPA GRES plant involve no discharge to the environment. Production wastewater is fully recycled back into the production process as an integral part of a zero-liquid discharge system.

f. Reuse of process waste: Process waste from CIPA GRES, with the exception of waste code EWC 101209 (spent lime), is fully recycled off-site by other ceramic companies in the district for their specific internal production. The total recycling of the aforementioned waste exceeds 90% by mass, as reported in the annual reports following the requirements of the Integrated Pollution Prevention and Control (IPPC/AIA) authorization.

g. Glazes and inks: Requirement not applicable; Cipa Gres products are of the unglazed technical type.

Requirement		Declared value	Limited value accepted	
Fuel consumption	*Spray drying process*	*< 1.8 MJ/kg of powder*	*Mandatory limit*	*1.8 MJ/kg*
	Drying and firing	*< 4.3 MJ/kg*	*Excellence threshold for product family*	*4.3 MJ/kg*
CO_2 emissions	*Spray drying process*	*< 84 kg CO_2/t of powder*	*Mandatory limit*	*84 kg CO_2/t*
	Drying and firing	*< 290 kg CO_2/t*	*Excellence threshold for product family*	*290 kg CO_2/t*
Air emissions	*Dust (spray dryer)*	*< 90 mg/kg of powder*	*Mandatory limit*	*90 mg/kg of powder*
	Dust (kiln)	*< 10 mg/kg*	*Excellence threshold for product family*	*10 mg/kg*
	HF (kiln)	*< 6 mg/kg*	*Excellence threshold for product family*	*6 mg/kg*
	NOx (kiln)	*< 170 mg/kg*	*Excellence threshold for product family*	*170 mg/kg*
Recycling of process waste		*> 98%*	*Mandatory limit*	*> 90%*

Table: Compliance with relevant limits Criterion 4.4 of Decision (EU) 2021/476 for CIPA GRES products

REFERENCES

IT 15804+A2	IT 15804:2012+A2:2019: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
IT ISO 14025	IT ISO 14025:2011-10 Environmental labels and declarations — Type III environmental declarations — Principles and procedures
IT ISO 14040	IT ISO 14040:2009-11 Environmental management — Life cycle assessment — Principles and framework
IT ISO 14044	IT ISO 14044:2006-10 Environmental management — Life cycle assessment — Requirements and guidelines
LCA for Experts (GaBi)	Life Cycle Assessment software (version 10), by Sphera Solutions GmbH, Leinfelden-Echterdingen, 2023 https://sphera.com/life-cycle-assessment-lca-software/
Managed LCA Content (GaBi database)	Life cycle assessment database, by Sphera Solutions GmbH, Leinfelden-Echterdingen, 2023 https://sphera.com/life-cycle-assessment-lca-database/
PCR ICMQ REV3	ICMQ-001/15, 2017– rev.3: Construction products and construction services, EPD Italy. Issue date: 02/12/2019, valid until:01/12/2024.
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BNB 2011	BBSR Table "Service life of components for life cycle assessment under BNB", Federal Institute for Research on Building, Urban Affairs and Spatial Development, Division II Sustainable Building; available online at http://www.nachhaltigesbauen.de/baustoffundgebaeudedaten/useful Lives-of-bauteilen.html; stand 12/2015
GBC american	US Green Building Council, Leed v3, 2009, Whole-building life-cycle assessment. LEED BD&C v4 (Building Design and Construction LEED).
PD CEN/TR 15941:2010	Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data
EUROSTAT	EUROSTAT Background data: Packaging waste from waste management operations
PCR IBU Part B	Part B: EPD requirements for ceramic tiles and panels 19/10/2023. www.ibuepd.com
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