Gruppo Romani S.p.A.

ENVIRONMENTAL PRODUCT DECLARATION

Product Name:

GRUPPO ROMANI CERAMIC TILES
8,5 – 10 mm

Site Plant:

Via Platone 9, 42048 Rubiera (RE), Italy

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

Program Operator	EPDItaly
Publisher	EPDItaly

Declaration number	*GRUPPOROMANIEPD001*
Registration number	EPDITALY0834

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1. GENERAL INFORMATION

EPD OWNER	
Company name	GRUPPO ROMANI SPA
Legal head office	***Via Volta 9, 42013 Casalgrande (RE), Italy***
Contacts for information on the EPD	info@grupporomanispa.it
PROGRAM OPERATOR	
EPDITALY (www.epditaly.it)	via Gaetano De Castillia n° 10 - 20124 Milano, Italia
INFORMATION ON THE EPD	
Product name	**GRUPPO ROMANI CERAMIC TILES** ***8,5 – 10 mm***
Plant involved in the declaration	Via Platone 9, 42048 Rubiera (RE), Italy
Short product description	Ceramic Tiles with average thickness 8,5 – 10 mm
Application area	The ceramic surfaces subject to this study are intended to be applied to both floor and wall coverings, and to be installed in both indoor and outdoor environments for residential, non-residential, and commercial use. Worldwide
CPC Code	37370
VERIFICATION INFORMATION	
Product Category Rules (PCR)	EN 15804:2012+A2:2019 is the framework reference for PCRs. PCR ICMQ-001/15 rev3.1
EPDItaly regulation	General Programme Instruction document of EPDItaly v.6
LCA tool	EPD based on a verified LCA tool: LCA tool creator for Ceramic Tile V6 [(27/11/2023) - DB version 2023.2]
Project LCA Tool Report	Background report for LCA tool for Confindustria Ceramica – 27/11/2023
Project Short Report	EPD Gruppo Romani Ceramic Tiles 8.5-10mm Stb. Rubiera
INDIPENDENT CHECK	Independent verification of the declaration and data, according to EN ISO 14025:2010. Internal □ External ☑ Third party verifier: ICMQ SpA, via De Castillia, 10 20124 Milano (www.icmq.it). Accredited by Accredia.
COMPARABILITY	Environmental statements published within the same product category, but from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804:2012+A2:2019. The EPD Owner releases EPDItaly from any noncompliance with environmental legislation. The holder of the declaration will be responsible for the information and supporting evidence. EPDItaly accepts no responsibility for the information, data and results provided by the EPD Owner for the life cycle assessment.
ACCOUNTABILITY	
Additional information	
TECHNICAL SUPPORT	Sphera https://www.sphera.com

2. THE COMPANY

"A FIRM IS A MAN WHO BELIEVES IN HUMAN FUTURE"

A major industrial group created by the Romani family, whose third generation members remain at the helm of the business today
A close-knit family with time-honoured traditions and modern ideas, with resolve and honesty as its foundational values, representing a successful example of generational succession.
Founders Lamberto Romani and his wife Alba Maria Spadazzi created and shaped the company, which went on to garner commercial successes all over the world. Sons Giorgio and Paolo shared the vision and projects, building one of the most important companies for the ceramic industry, and for the surrounding area.
The industrial history of the Romani family started in 1968, as the authentic expression of Made in Italy values, marked by passion, competency and the objective of continuous growth.
A constant unwavering commitment to reconciling industrial needs with extreme care for the place that nurtured our birth and supported the growth of our business, shaping the identity of both product and company. Fifty years of history, expressed in the parallel and distinctive realities of the brands, reveal a Group that has always looked forwards, relying on continuous innovation, in the conviction that each goal reached becomes the new point of departure.
In 2016 the company established under the name Ceramiche Serenissima, became Gruppo Romani, a new international trademark which has reinforced the company's – and the family's – identity, and clearly outlined its commercial profile.
The group's brands, Serenissima, Cir, Cercom and Cerasarda, have acquired new strength and their own precise identity as part of a consolidated group with clear future objectives.
In 2022 we launched our "Tiles For Life" slogan to share our vision of balancing the economic aspect of our work with the environmental and social spheres, underscoring the influence our work can have on daily life. At Gruppo Romani we see our steadfast commitment to these areas as a tangible expression of our core values, and also as an insatiable desire to grow and to manifest the vision of our founder, Lamberto Romani: "A firm is a man who believes in human future". Today, we are still proving that operating as an enterprise means believing in the future of the community, in Italian excellence and that of the world around us, working tirelessly to integrate sustainable practices in each aspect of our operations, bringing them into line with the tenets of holistic wellness.

Management systems, environmental and quality brands:

The company has adopted a quality management system in compliance with the ISO 9001:2015 standard since 2016 and since 2024, an energy management system in compliance with the ISO 50001:2018 standard.

3. GOAL AND SCOPE OF EPD

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

*Modules **A1-A3** include those processes that provide energy and material input for the system (A1), transport up to the factory gate of the plant (A2), manufacturing processes as well as waste processing (A3).*

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

*Module **A5** considers all tile installation steps (like adhesives consumption) also packaging waste processing (recycling, incineration, disposal). Credits from energy substitution are declared in module D. During this phase a ceramic material loss of 6,5% has been considered.*

*Module **B2** includes the cleaning of the tiles. Provision of water, cleaning agent for the cleaning of the tiles, incl. waste water treatment are considered.*

*Module **C1** concerns the process of demolition and de-construction of the tiles from the building. It is not considered relevant for the environmental impacts.*

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

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

*Module **C4** includes all the landfill disposal processes, including pre-treatment and management of the disposal site.*

*Module **D** includes benefits from all net flows in the end-of-life stage that leave the product boundary system after having passed the end-of-waste stage. Loads from packaging incineration (A5) and resulted 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 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	B3	B4	B5	B6	B7	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 type of EPD is an average EPD for the product "Porcelain stoneware surfaces - tile and slab" produced in Gruppo Romani's Rubiera plant located in Via Platone 9, 42048 Rubiera (RE). All data refer to the 2023 production and sales.
According to the PCR ICMQ-001/15 rev. 3 the LCA study and the relative EPD, is "cradle to grave". Modules included are A1, A2, A3, A4, A5, B1-B7, C1, C2, C3, C4 and D. All manufacturing activities and packaging/auxiliary's production are in module A3, while energy production and input materials are in A1. Transport to clients (A4) and installation (A5) are included together with end-of-life scenarios (benefits and loads included according to D module).

GEOGRAPHICAL VALIDITY:

Performance was calculated with reference to the company sites. The reference market is worldwide.

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 at the plant of raw materials (clays, feldspars, sands and pigments) taken from quarries located in Italy and abroad. All natural raw materials arrive at the plant on wheels. The raw materials for the ceramic body are stored in boxes located in a covered area of the plant and then inside large silos from which they are extracted in the appropriate percentages for the body dosage. The quality of the ceramic mixture and the consistency of its characteristics are ensured by an automatic, computerized and continuous weighing and dosing system, which can guarantee the maintenance over time of the exact percentages of the components according to the predetermined formula.
Raw materials for decoration are stored in covered areas and are dosed for the formulation of different applications.

Manufacturing:

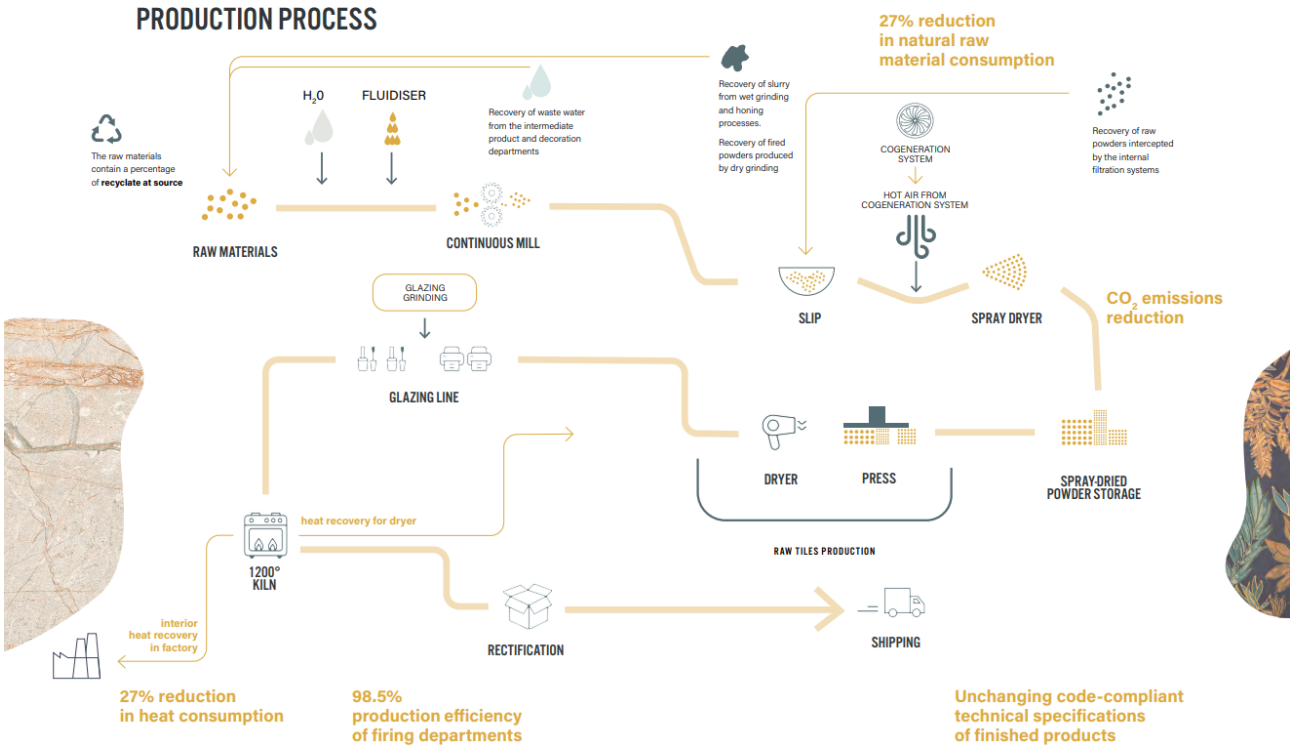
The process begins with the automated batching of the raw materials that make up the various types of ceramic bodies. The raw materials are wet milled, meaning water is added, in continuous mills to obtain a liquid slurry with a water fraction of about 30 percent, called "slip" in ceramic terminology. The slip is then pumped into spray dryers, known as "spray dryer," where it is atomized into very fine droplets of different sizes. These droplets are passed through a flow of air heated to about 600°C, producing "the atomized" mixture—a blend of granules with controlled humidity and an appropriate particle size distribution, ensuring optimal compaction during the subsequent pressing stage. A large battery of silos is set up to store the atomized material, which will later be sent to the pressing stage. The tile is formed by compressing the atomized material using high-powered hydraulic presses, which give it the desired size, thickness, and surface type (smooth, textured, etc.).
The tile formed in this way is then subjected to the drying phase at a temperature of around 200-220°C, during which it undergoes a drastic reduction in moisture and a significant increase in mechanical strength "in the raw," both necessary factors for the subsequent production stages. The pressed tiles can then undergo glazing and digital decoration applications. The firing stage takes place in industrial kilns that allow for uniform temperature distribution throughout all areas of the kiln, eliminating issues related to color variation and uneven firing. The prolonged exposure to high firing temperatures, up to about 1200-1220°C, leads to the complete vitrification of the material throughout its mass. As a result, ceramic tiles with almost zero porosity are obtained, offering excellent mechanical strength (breaking load, flexural strength, resistance to abrasion and scratching) and resistance to chemical aggressors. Before selection, most of the material undergoes mechanical processing, such as cutting (to obtain smaller formats), finishing (to achieve tiles with extremely straight and orthogonal edges, allowing for tight grout joints), and polishing (mechanical abrasion of the surface with extremely hard tools to obtain smoother, pleasant-to-the-touch surfaces with varying degrees of shine). In the selection department, each ceramic piece is inspected for dimensions, flatness, orthogonality of the edges, color, and surface quality (absence of defects) by specialized operators and automatic sorting machines. The finished products are packaged in homogeneous batches according to article, selection grade, tone, and "caliber."

Packaging:

The main materials used for product packaging are wood, plastic, and paper. Wood (in the form of pallets) is the primary material used for the packaging structure, while paper serves as the main packaging material. The use of automatic boxing machines has optimized cardboard usage by allowing the use of thinner paper and cardboard formats, thus reducing waste. Polyester plastic strapping is employed to stabilize and secure the tile boxes, while PE shrink film is used to enclose and package the entire pallet of boxes.

Shipping warehouse:

The pallets, on which the finished product boxes are placed, are stored in the parking lot outside the plant. The handling of the finished product to the warehouse is managed through a pallet identification barcode label affixed to the final packaging. Once this process is complete, the product is ready for shipment.



HEALTH AND SAFETY OF WORKERS:

The group operates in accordance with current national health and safety regulations.
The Group undertakes to ensure that all internal and external persons are correctly trained and informed in relation to occupational health and safety, guaranteeing a safe, healthy workplace and paying attention to risk management.)

ENVIRONMENTAL PROTECTION:

The group operates in accordance with current national environmental regulations.
The plant holds an Integrated Environmental Authorization (AIA), which requires compliance with stringent regulations regarding pollutant emissions into the atmosphere, noise impact, waste management, energy consumption, and water and raw material balances. As defined by the AIA itself, emissions from the production process are continuously monitored and are consistently well below the authorized limits. The plant does not generate wastewater discharges; all process water is reused, either directly or after treatment, within the production cycle, avoiding the use of fresh water. Additionally, all ceramic waste materials from the production cycle (dust, mixes, and raw tiles) are recovered.
In the production process, Gruppo Romani adopts, where possible, the Best Available Technology (BAT) outlined in the latest revision of the ceramic BREF (Best Available Techniques Reference Documents).
Energy efficiency systems are in place for heat recovery, such as for heating the workspaces, and for thermal recovery in the atomization process. Photovoltaic systems are installed on the plant's roofs to generate electricity from renewable sources.

Technical data: "8.5 – 10 mm ceramic tiles".

The products meet the requirements defined by the European standard UNI EN 14411:2016 and the international standard ISO 13006:2018, according to the criteria established by the ISO 10545 testing methods outlined below.

Name	Value	Unit
Shaping acc. to EN14411	B: dry pressing	
Small color differences acc. to ISO1045-16	V2 / V3 / V4	-
Tactility acc to CEN/TS 15209		
Surface quality acc. to ISO 10545-2 § 7	≥ 95	%
Water absorption acc. to ISO 10545-3	≤ 0,3	%
Breaking Strength acc. to ISO 10545-4	≥ 1300	N
Flexural strength acc. to ISO 10545-4	≥ 35	N/mm²
Resistance to deep abrasion – Unglazed tiles acc. To ISO 10545-6	-	-
Resistance to surface wear– Glazed tiles acc. to ISO 10545-7	Class 3/4/5	-
Coefficient of linear thermal expansion acc. to ISO 10545-8	6,4 x 10^{-6} °C^{-1}	°C^{-1}
Thermal shock resistance acc. to ISO 10545-9	Resistant	-
Crazing resistance acc. to ISO 10545-11, glazed tiles	Resistant	
Frost resistance acc. to ISO 10545-12	Resistant	-
Nonslip property (class A, B or C) acc. to. CEN/TS 16165	A+B / A+B+C	-
Bond strength /adhesion acc. to. EN 12004		
Impact resistance acc. to ISO 10545-5	-	-
Reaction to fire NO testing (CWT)	$A1_{FL}$/A1	
Resistance to low concentrations of acids and alkalis acc. to ISO 10545-13	LA	-
Resistance to household chemicals and swimming pool salts acc. to ISO 10545-13	A	-
Resistance to low and high concentrations of acids and alkalis acc. to ISO 10545-13	HA	-
Resistance to staining acc. to ISO 10545-14	Class 5	-
Release of lead and cadmium – Glazed tiles acc. to ISO 10545-15	Pb <0,05 Cd <0,02	mg/L
Moisture expansion acc. to ISO 10545-10	-	-

BASE MATERIALS / ANCILLARY MATERIALS:

Main raw materials for ceramic tile:

- Clay - 40 %
- Feldspars - 38 %
- Sand - 15 %
- Waste - 6 %
- Glaze – 1%

Main components of the glaze:

- Clay powder
- Feldspar
- Quartz
- Alumina
- Frits
- Pigments

PRODUCT PROCESSING/INSTALLATION

Tiles are fixed to the walls and floors surfaces using different materials and amounts, for example, dispersion and cementitious adhesives and mortars, sealants or liquid applied membranes. During the installation, no emissions occur and no health or environmental risks derive from ceramic tile installations.

RELEVANT EFFECTS DURING USE

Fire: In accordance with /EN 13501-1:2007+A1:2009/, ceramic tiles can be classified as fire resistance class $A1_{FL}$/A1 as they are non-flammable.

Coating ceramic tiles in the event of fire has been shown to reduce the heat input on them and thus the risk of collapse.

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

ENVIRONMENT AND HEALTH DURING USE

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

DECLARED UNIT and REFERENCE FLOW

The declared unit is 1 m^2 ceramic tiles for covering walls and floors for 1 year. The mass of the surface considered is 21 kg, while the thickness is 8.5 – 10 mm.

Parameter	Minimum value	Maximum value	Average value
Thickness [mm]	8.5	10	9-9.5
Mass [kg]	19	23	21

REFERENCE SERVICE LIFE (RSL)

The service life of tiles is typically more than 50 years (BNB 2011). Furthermore, according to the US Green Building Council, the useful life of tiles could be the same as the useful life of the building itself. Therefore, 60 years represents an alternative for tiles. The reported results consider the use of tiles for 1 year, multiplying the B2-values by 50 or 60 gives B2-values for 50 or 60 years. No RSL was defined according to ISO 15686.

MECHANICAL DESTRUCTION

Ceramic tiles can be smashed mechanically, but no harmful damage on the environment is expected.

RE-USE PHASE

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

DISPOSAL

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

5. LCA RESULTS

The tables below show the results of the LCA (Life Cycle Assessment). Basic information on all declared modules can be found in chapter 3.

You can convert the results per kg using the following conversion factor: Insert conversion factor (1/tile density)

Environmental Impact indicators for 1m² of ceramic tile														
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP total	kg CO_2-eq.	4.18	1.06	5.51	0.83	3.13	0	0.0118	0	0.0174	0.0807	0.0478	0.122	-0.214
GWP fossil	kg CO_2-eq.	4.16	1.02	6.25	0.799	2.11	0	0.0089	0	0.0166	0.0772	0.0479	0.121	-0.213
GWP biogenic	kg CO_2-eq.	0.0276	0.0408	-0.734	0.0312	1.02	0	0.00285	0	0.00076	0.00352	-0.000495	0.000339	-0.000956
GWP luluc	kg CO_2-eq.	0.000991	6.08E-005	0.000662	4.55E-005	0.00105	0	1.34E-006	0	1.04E-006	4.92E-006	0.000367	0.000381	-0.000131
ODP	kg CFC-11-eq.	2.85E-011	3.32E-013	2.13E-012	8.97E-014	5.87E-012	0	4.19E-014	0	1.96E-015	9.24E-015	8.15E-014	3.12E-013	-1.69E-012
AP	mole of H^+-eq.	0.0078	0.00702	0.00553	0.00482	0.00364	0	1.55E-005	0	8.33E-005	0.000116	0.000254	0.00087	-0.000408
EP - freshwater	kg P eq.	7.04E-006	2.65E-007	1.75E-006	1.94E-007	9.14E-006	0	3.56E-006	0	4.01E-009	1.89E-008	1.66E-007	2.47E-007	-6.2E-007
EP - marine	kg N eq.	0.00221	0.00242	0.0027	0.00121	0.00132	0	1.75E-005	0	3.95E-005	4.62E-005	0.000117	0.000225	-0.000134
EP - terrestrial	mole of N eq.	0.0244	0.0267	0.0298	0.0133	0.0147	0	4.59E-005	0	0.000433	0.000509	0.00129	0.00247	-0.00145
POCP	kg NMVOC eq.	0.007	0.0056	0.00772	0.00343	0.0032	0	1.94E-005	0	0.000112	0.000111	0.000317	0.000678	-0.000428
ADPE	kg Sb eq.	4.86E-005	1.32E-008	5.67E-006	9.63E-009	6.37E-006	0	3.96E-010	0	2.05E-010	9.69E-010	5.22E-008	5.67E-009	-1.66E-008
ADPF	MJ	156	14.8	7.39	11.4	19.5	0	0.198	0	0.238	1.12	0.959	1.63	-4.6
WDP	m^3 world eq.	0.534	0.00421	0.652	0.00186	0.183	0	0.00156	0	3.99E-005	0.000188	0.00948	0.0135	-0.0143

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 1m² of ceramic tile														
Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PERE	[MJ]	15.9	0.156	8.19	0.0704	0	0	0.0242	0	0.00154	0.00726	0.0892	0.266	-1.02
PERM*	[MJ]	0	0	0.345	0	-0.345	0	0	0	0	0	0	0	0
PERT	[MJ]	15.9	0.156	8.54	0.0704	4.57	0	0.0242	0	0.00154	0.00726	0.0892	0.266	-1.02
PENRE	[MJ]	156	14.8	7.3	11.4	19.6	0	0.198	0	0.239	1.13	0.961	1.63	-4.6
PENRM*	[MJ]	0	0	0.0928	0	-0.0928	0	0	0	0	0	0	0	0
PENRT	[MJ]	156	14.8	7.4	11.4	19.5	0	0.198	0	0.239	1.13	0.961	1.63	-4.6
SM	[kg]	0.742	0	0.409	0	0.0748	0	0	0	0	0	0	0	18.5
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]	0.017	0.000217	0.0167	8.28E-005	0.00557	0	5.62E-005	0	1.79E-006	8.44E-006	0.000274	0.000413	-0.000909

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

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 = Use of net fresh water

Wastes input/output flows for 1m² of ceramic tile														
Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
HWD	[kg]	3.22E-007	5.63E-011	1.82E-009	2.29E-011	2.14E-008	0	1.03E-011	4.4E-013	2.08E-012	-2.49E-012	3.56E-011	-1.88E-010	4.4E-013
NHWD	[kg]	0.517	0.00153	0.653	0.00112	1.6	0	0.00604	2.38E-005	0.000112	0.000253	8.17	-0.772	2.38E-005
RWD	[kg]	0.0014	9.9E-005	0.000152	1.83E-005	0.000324	0	4.49E-006	3.98E-007	1.88E-006	1.29E-005	1.86E-005	-0.000198	3.98E-007
CRU	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	0.0619	0	0.0364	0	0	0	0	19	0	0	0
MER	[kg]	0	0	0	0	0.178	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; EEE = Exported thermal energy

Biogenic carbon content of product and packaging for 1m² of ceramic tile														
Parameter	Unit	A1	A2	A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
Biog. C in packaging	[kg]	0	0	0.00927	0	-0.00927	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	Biog. C in packaging = Biogenic carbon content in packaging; Biog. 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 seen in the /Background Report/.

Disclaimer for EN 15804+A2: additional indicators

(1) Potential Human exposure efficiency relative to U235 (IRP): 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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

(2) The results of the environmental impact indicator: 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
Grammage	21	kg/m^2
Conversion factor to 1 kg	0,048	-

ASSUMPTIONS:
The modules from A5 to C4 are scenarios based on average data included into the PCR created by the "European Ceramic Tile Manufacturers Federation" /CET PCR 2014/ and subsequently implemented in the PCRb of the IBU program operator "Ceramic tiles and panels".

CUT-OFF CRITERIA:
All known inputs and outputs were considered.

DATA QUALITY:
The period of validity of background data from Sphera database is between 2019 and 2023. Most of the information (energy and water consumption, pollutant emissions, atomized dust, and ceramic production) are measured or calculated directly at the company level and declared in the Italian IPPC document called AIA, which is specific and is verified for each plant involved in this study. Carbon dioxide emissions (related to carbonate oxidation) are collected through ETS (emissions trading system) reporting.
Detailed data were obtained not only for raw material mixtures (collected with company-specific primary data) but also for dyes, frits and other raw materials used.
The overall quality of the data can be considered satisfactory.
The emission factor for electricity (GWP total) considered is 0,2085 kg CO_2 eq. / 1 kWh.

PERIOD UNDER REVIEW:
The primary data collected in the study refer to 2023.

ALLOCATION:
Energy and material supplies have been allocated to the product based on annually produced mass of ceramic tiles. No further allocations have been applied within the subsequent module.

Moreover, some ceramic wastes are internally recycled; credits from energy recovery of packaging materials from the end-of-life of the product are taken into account.

VARIABILITY ANALYSIS:
The average EPD covers the thicknesses of ceramic tiles produced by Gruppo Romani S.p.A. that fall within the 8.5-10 mm range. All products considered in the EPD fall within an impact variation of ±10% for the following indicators:

- Climate Change - total
- Acidification
- Photochemical ozone formation, human health
- Resource use, mineral 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 about declared modules and related scenarios is based on average data, according to the “European Ceramic Tile Manufacturers Federation” and and subsequently implemented in the PCRb of the IBU program operator "Ceramic tiles and panels".

Transport (A4):

The LCA practitioner should justify the transportation scenario used (if different from the default scenario). For transport distances of less than 300 km, trucks shall be assumed to make the return trip empty, whereas for distances exceeding 300 km, they will return full with other goods, so that the return trip is not included in the inventory of the system analysed.

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 shipment (31% of tiles sold)	6520	km

Installation into the building (A5):

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

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

These considerations are based on average data provided by different ceramic tile manufacturers in Europe. In this EPD it is assumed that 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"; thus end-of-life consists of recycling, energy recovery and landfill for plastic and paper, and reuse, energy recovery and landfill for wood.
The loss of ceramic material considered is 6.5%.

Maintenance (B2):

Only stage B2, the maintenance phase, is considered in terms of impact generation. Throughout its lifetime, the ceramic cladding product 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 phase considering an excavator (100kW) with a consumption of diesel of 1.72E-4 per kg of product and all the emissions connected with the fuel burning process.

C2: The ceramic tile demolition waste is transported from the building site to a container or treatment plant by truck and an average distance of 20 km is considered. The return trip shall be included in the system. It can be considered an average distance of 30 km from the container or treatment plant to final destination.

C3-C4: the table below show 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 from materials recycling of products and packaging, energy credits from thermal recovery of the packaging.

8. ENVIRONMENT AND HEALTH DURING USE

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

9. OTHER ADDITIONAL ENVIROMENTAL INFORMATION

THE BIOGENIC CARBON CONTENT

The biogenic carbon content of product and packaging for 1m² of ceramic tile is reported as follows.

Parameter	Value	Unit
Biogenic C in packaging	0,00927	kg
Biogenic C in product	0	kg

RECYCLED CONTENT

The total recycled material content in accordance with the EPD Italy regulation rev. 6, Annex 7, calculated for the calendar year 2023. Method for determining the recycled/recovered/by-product content: Regulation CP DOC 262 Rev. 2.2, 14/08/2023.

Recycled content 2023				
% Recycled (pre- consumer)	% Recycled (post-consumer)	% Recovered	% by-products	Total
5,22	0	1,04	4,40	10,66

COMPLIANCE WITH THE CAM (MINIMUM ENVIRONMENTAL CRITERIA)

The products meet the characteristics and requirements set by the Minimum Environmental Criteria (CAM), developed within the framework of the national "green public procurement" strategy (GPP - Green Public Procurement). Gruppo Romani products comply with the technical specifications for ceramic tiles outlined in the CAM as they meet the following criteria included in Decision (EU) 2021/476 for the awarding of the Ecolabel.

The product is also compliance with point 2.5.10 of the Ministerial Decree of June 23, 2022 - Minimum Environmental Criteria (CAM) developed within the national "green public procurement" strategy (GPP – Green Public Procurement).

The products comply with the technical specifications for ceramic tiles outlined in the CAM as they meet the following criteria included in Decision (EU) 2021/476 for the awarding of the Ecolabel.

Common Criteria

1.1. Mineral Extraction

Gruppo Romani ensures that all raw material suppliers operate in accordance with conditions that allow them to provide the following documentation: an environmental impact assessment, a valid extraction authorization, a site-specific environmental recovery plan related to the extraction activity, an updated map showing the quarry location, and a compliance declaration with EU Regulation No. 1143/2014 (prevention of invasive alien species), as well as EU Directives 92/43/EEC (Habitats Directive) and 2009/147/EC (Birds Directive).

1.2. Substances Subject to Restrictions

All substances used in the production process and present in the supplied materials do not contain, in concentrations greater than 0.10% (weight/weight), any substances that meet the criteria outlined in Article 57 of Regulation (EC) No. 1907/2006 (REACH) and have been identified under the procedure described in Article 59 of the same regulation, including those listed as substances of very high concern for authorization.

Titanium dioxide (TiO_2) is not intentionally added to the product, but is naturally present as an impurity in the raw materials used, always in amounts below 2.0% (weight/weight). Additionally, strict adherence to the safe handling and dosing instructions for the materials is ensured. Cutting operations at the plant are performed using wet processing tools or dry processes equipped with dust collection hoods.

1.3. VOC Emissions

Ceramic tiles are recognized as inert materials with no harmful emissions.

During the production of ceramic tiles, the product undergoes an industrial firing process at a peak temperature of around 1200°C, where volatile organic components are fully oxidized. As the final product's surface is not treated with resins, formaldehyde-based resins, waxes, adhesives, coatings, or other similar chemicals, compliance with the limits for Volatile Organic Compounds (VOCs) emissions is guaranteed.

1.4. Suitability for Use

The products undergo thorough quality checks and evaluations to ensure they are fit for their intended use. They comply with the relevant EN/ISO standards. Specifically, the production site is ISO 9001:2015 certified for the scope of "Design, production, and marketing of porcelain stoneware tiles and ceramic finishes, ceramic decorative items, and furnishings (IAF 15)." The group has a formal consumer complaint management procedure in place, and the products are CE marked in accordance with the technical standard UNI EN 14411:2012 and Regulation (EU) No. 305/2011 of the European Parliament and Council on construction products.

1.5. Information for Users

The company's products are provided with the necessary information to ensure proper installation, maintenance, and disposal. The packaging and accompanying documentation include contact details and a reference to online information where consumers can find answers to specific questions or detailed guidance on installation, maintenance, or disposal of the product.

Specific criteria for ceramic products

4.1 Combustion of Fuels

The specific fuel energy consumption for the drying and firing processes, as shown in the following table, does not exceed the relevant mandatory limits.

Process	Mandatory Limit (MJ/kg powder)	Calculated Value Gruppo Romani (MJ/kg powder)
Spray dryer	1,8	0,924
Dryer and firing	5,5	2,731

4.2. CO_2 emissions

The specific CO_2 emissions associated with fuel use and the process emissions resulting from the decarbonation of raw materials during the drying and firing processes, as shown in the following table, do not exceed the relevant mandatory limits.

Process	Mandatory Limit ($kgCO_2$/ton powder)	Calculated Value Gruppo Romani ($kgCO_2$/ton powder)
Spray dryer powder	84	46,944
Dryer and firing	360	138,732

4.3 Water consumption

The production facility has a closed-loop recycling system for wastewater treatment that facilitates zero liquid discharge. Wastewater from the washing of plants and production lines is fully recovered during the dough grinding phase. For dough grinding, the water demand is primarily met by recovering all wastewater generated internally rather than sourcing it from third-party suppliers. As a result, the facility does not discharge any industrial wastewater to third-party companies or bodies of water and maintains water recycling rates exceeding 100%, as it reuses wastewater generated internally as well as from third parties. This ensures the lowest possible impact on its water consumption.

4.4. Air Pollutant Emissions

The specific emissions of dust, HF, NOx, and SOx in the air, associated with the production of the group's products, as reported in the table below, do not exceed the relevant mandatory limits.

Emission Parameter		Mandatory Limit (mg/kg)	Measured Emission Gruppo Romani (mg/kg)
Spray dryer	Dust	90	15,450
Firing	Dust	50	8,182
	HF	20	1,705
	NOx	250	127,302
	SOx	1300	0,000

4.5. Wastewater Management

The plant has a closed-loop recycling system for wastewater treatment, allowing zero liquid discharge. Wastewater from washing the plants is recovered during the milling process, meeting the water needs without relying on external suppliers. The water needs are primarily met by recovering all internally generated wastewater, rather than from third-party companies that supply wastewater here. Cooling water for the abrasive wheels is also recycled in a closed-loop system, with solid particles removed before reuse.
The plant does not discharge industrial wastewater to third parties or into water bodies, achieving a water recycling rate exceeding 100%, minimizing the impact on water consumption.

4.6 Reuse of Process Waste

The company regularly compiles an inventory of process waste, specifying the type and quantity of process waste generated. Furthermore, 100% of the mass of process waste generated from ceramic product manufacturing is incorporated into the production process at the site.

4.7 Glazes and inks

In glazed or decorated tiles, the glaze or ink formulation contains less than 0.10% Pb by weight and less than 0.10% Cd by weight.

REFERENCES

EN 15804+A2	EN 15804:2012+A2:2019: Sustainability of construction works -Environmental Product Declarations - Core rules for the product category of construction products
EN ISO 14025	EN ISO 14025:2011-10 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
EN ISO 14040	EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles andframework
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BNB 2011	BBSR table "useful lives of components for Life Cycle Analysis by BNB ", Federal Institute for 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
US GBC	US Green Building Council, Leed v3, 2009, Whole building life cycle assessment. LEED BD&C v4 (LEED Building Design & Construction).
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