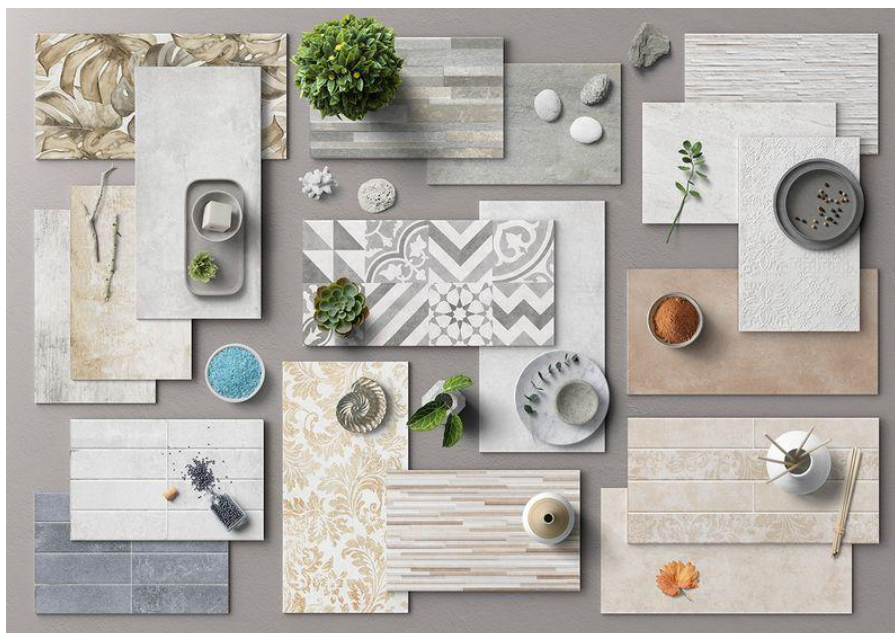


Exportceram Fideuro S.p.A.



ENVIRONMENTAL PRODUCT DECLARATION



Product Name

EXPORTCERAM FIDEURO S.P.A.

TILES 6,4 – 7 mm

Format cm. 26,1x52,2

Site Plant:

Via La Piana 2, Montefiorino (MO)

in compliance with ISO 14025 and EN 15804+A2

Program Operator:	EPDItaly
Publisher:	EPDItaly

Declaration Number:	2652RIVINT
Registration Number:	EPDITALY1046

Issue Date:	29/07/2026
Valid to:	29/07/2031

1. GENERAL INFORMATION

EPD OWNER: <i>Company name</i> <i>Legal head office</i> Contacts for information on the EPD	EXPORTCERAM FIDEURO S.P.A. VIA CONTRADA 309 41126 MODENA (ITALY) info@exportceramfideuro.com
PLANT INVOLVED in the declaration:	Via La Piana 2, Montefiorino (MO)
SCOPE OF APPLICATION:	The ceramic surfaces subjects to this study are intended to be applied to wall coverings for internal use.
PROGRAM OPERATOR:	EPDITALY (www.epditaly.it) via Gaetano De Castillia n° 10 - 20124 Milano, Italia
INDEPENDENT CHECK:	This declaration has been developed referring to EPDItaly, following the General Programme Instruction; further information and the document itself are available at: www.epditaly.it. EPD document valid within the following geographical area: Italy and other countries according to sales market conditions. CEN standard EN 15804 served as the core PCR (PCR ICMQ-001/15 rev 3.2). Contact via info@epditaly.it. Independent verification of the declaration and data, according to EN ISO 14025:2010. Third party verifier: ICMQ SpA, via De Castillia, 10 20124 Milano (www.icmq.it) ☐ Internal ☒ External Third party verifier: ICMQ SpA, via De Castillia, 10 20124 Milano (www.icmq.it). Accredited by Accredia
EPD TYPE	Average EPD
CPC CODE:	37370
PRODUCT CATEGORY RULES (PCR):	PCR ICMQ-001/15 rev3.2 EN 15804+A2 is the framework reference for PCRs.
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 v.6 [(27/11/2023) - DB version 2023.2]
PROJECT REPORT	Background report for LCA tool for Confindustria Ceramica v.6, 27/11/2023 iReport 6,4 – 7 mm, 02/07/2026
REFERENCE DOCUMENT:	<i>This declaration has been developed following the General Programme Instruction document of EPDItaly, available at www.epditaly.it.</i>
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.
ACCOUNTABILITY:	EXPORTCERAM FIDEURO SPA relieves EPDItaly from any non-compliance with environmental legislation. The holder of the declaration will be responsible for the information and supporting evidence; EPDItaly declines all responsibility for the manufacturer's information, data and results of the life cycle assessment.

2. THE COMPANY



In today's global political and economic landscape, marked by increasing expectations from the public and stakeholders for greater environmental responsibility and enhanced social commitment toward employees and local communities, it has become essential to highlight the initiatives that Exportceram Fideuro S.p.A. has pursued in these areas for more than 40 years.

Established in the early 1970s, the company has consistently shaped its industrial operations through process innovation and advanced managerial organization, anticipating the ongoing transformations driven by evolving social and environmental awareness.

"The Factory System"

In 2013, the company undertook a major technological and infrastructural investment that resulted in a complete redesign of the production process and the adoption of an integrated Factory System. The replacement of the firing kiln and the introduction of the Universal Thermal Machine (MTU) enabled significant progress in terms of performance and efficiency.

It is important to note that EXPORTCERAM FIDEURO S.p.A. operates a full-cycle production process using dry milling.

Beyond ensuring the company's industrial continuity, competitiveness, and employment in an area with limited industrial activity, this substantial investment also led to the development of an innovative ceramic material known as "bi-oxidized." This material offers a 20–25% improvement in technical and mechanical properties compared to traditional double firing. It is an exclusive company patent, and—thanks to the integrated Factory System—it allows for the production of high-quality materials with lower consumption per square meter (clay, methane gas, transport) compared to traditional double-fired products.

The high degree of flexibility offered by the Factory System enables the company to manufacture various types of ceramic substrates, including bi-oxidized, inertized, single-fired, double-fired, and porcelainized products, allowing Exportceram Fideuro S.p.A. to respond effectively to market demands and ensure ongoing international competitiveness.

Management systems, environmental and quality brands: In 2025 the company has obtained both ISO 9001:2015 and ISO 14001:2015 certifications for its quality and environmental management systems.

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 **B1** considers the use of tiles. During the use of ceramic tiles, no hazardous indoor emissions are expected to occur.

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.

Modules **B3-B4-B5** are related to the repair replacement and refurbishment of the tiles. If the tiles are properly installed no repair, replacement or refurbishment processes are necessary.

Modules **B6-B7** consider energy use for operating building integrated technical systems (B6) and operational water use for technical building-related systems. No operational energy or water use are considered. Cleaning water is declared under B2.

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

Modules B1, B3, B4, B5, B6 and B7 can be considered to have no impact (negligible); ceramic tiles are intrinsically inert and therefore do not have environmental impacts during their use to be addressed in module B1 "Use/application". The environmental impacts generated during the B1 phase are therefore negligible. The ceramic tile is a long-lasting product, the repair is not expected to apply to ceramic tiles, and the impacts in module B3 can, therefore, be neglected. Moreover, tiles require neither replacement nor refurbishment during the use phase, and therefore, no impacts should be declared in modules B4 and B5. Likewise, tiles require no energy and water use once they are installed in a building, so modules B6 and B7 also have no impacts.

Impacts and aspects related to waste are considered in the module in which the waste occurs.

EPD TYPE:

The type of EPD is an average EPD for the product “Double-fired - Dry pressed tiles, with water absorption >10% for indoor wall (BIII) -produced in EXPORTCERAM FIDEURO SPA plants located in via La Piana 2 41045 Montefiorino (MO) and sold in worldwide. All data refer to the 2022 production and sales.

According to the PCR ICMQ-001/15 rev. 3.2 the LCA study and the relative EPD, is “cradle to grave”. Modules included are A1, A2, A3, A4, A5, B, C 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 2023.2

SOFTWARE: LCA for Experts v10.8

4. DETAILED PRODUCT DESCRIPTION

MANUFACTURING PROCESS DESCRIPTION:

Entry, storage and entry into production of raw materials:

The main raw material used in the production process is clay, taken from a local quarry, just 20 km from the plant. The second raw material for the ceramic body is riolite, coming from an Italian supplier. Both arrive by truck at the site and are stored in two different covered areas. Selected quantities of raw materials, according to the mixture recipe, are loaded in the grinding machine by wheels loader. After the grinding process the ceramic mixture is stored in silos.

Raw materials for glazing arrive at the plant by truck, packed with different sizes and packaging (big bag, tank, sack, ecc.) and are stored in a covered warehouse area.

Manufacturing:

From the storage silos, the ceramic mixture is conveyed to the pressing stage to create the tile substrate. The company has two presses, typically operating alternately, but can also operate simultaneously. During the pressing process, dust emissions are generated and conveyed by dedicated localized extraction systems to fabric purification filters.

After the pressing stage the ceramic mixture is shaped in tiles with different sizes and thickness according to the production programs and the customers requests. Tiles are conveyed by conveyor belts in a first drying stage that reduce the moisture content from 6-7% to 1-1,5%. The next step is the first firing stage that takes place in a double layer kiln at a temperature of around 1100°C: after this process tiles have an excellent mechanical strength and pass to the glazing stage. Glazes are previously prepared in a specific area where raw materials are selected, weighted according to the different glaze formulas, and milled with water in some grinding machines. Glazes arrive by pump in the glazing areas where tiles are covered with different glaze layers and decorated with a digital print system using ceramic inks.

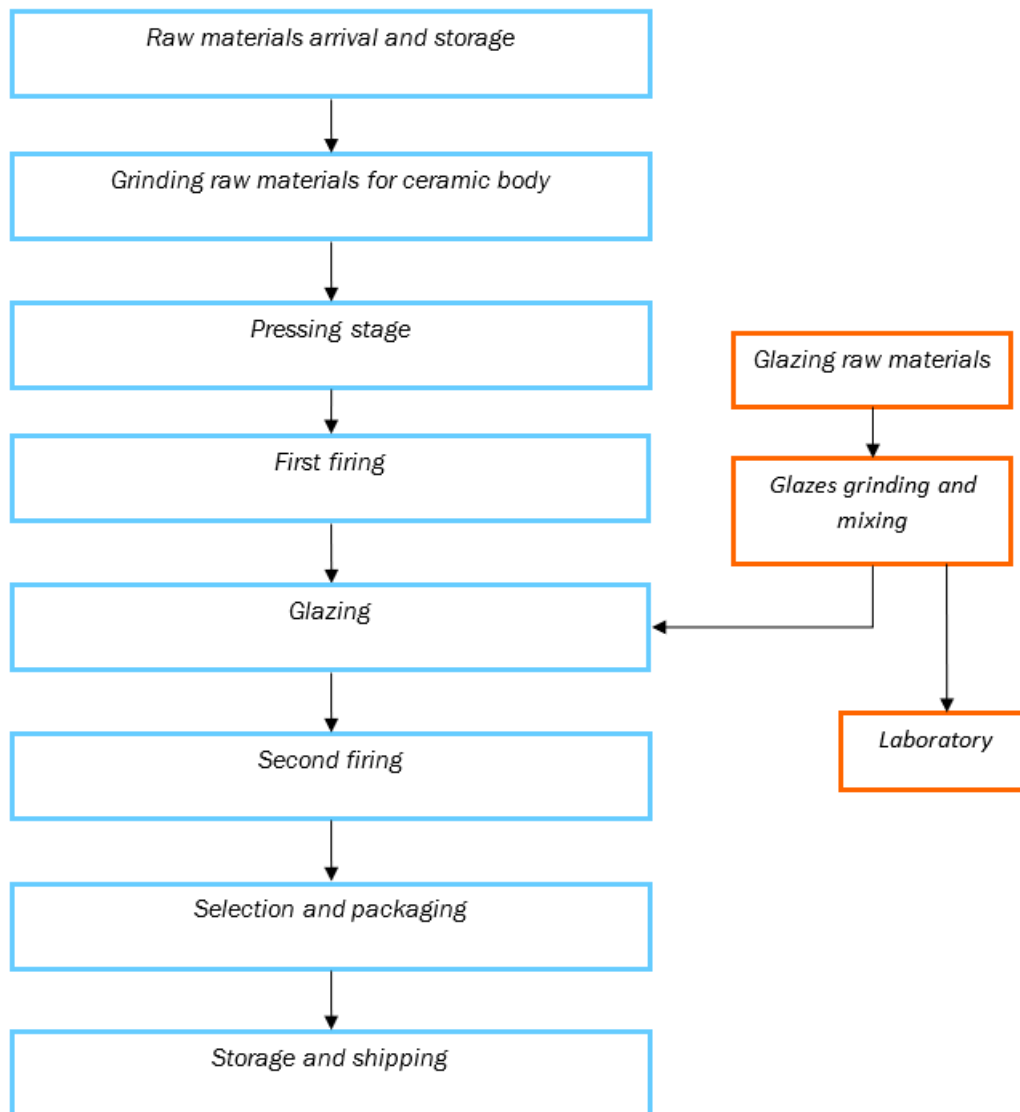
After glazing stage, tiles are conveyed inside a one-layer kiln for the second firing stage at a temperature of 1080°C. When tiles come out the kiln are conveyed to the selection and packaging stage.

Packaging:

Last process stage is the selection: according to surface quality and respect of dimensional parameters, tiles are automatically collected in groups and packed with folded paper cardboard to make a tiles box. Every box is loaded on a wood pallet by a loading machine. Every pallet of boxes is covered by plastic film, shrinking by a hot air oven, and is stored in a parking lot.

Shipping warehouse:

The pallets are stored in a parking lot where they are picked up with forklift loader and are carried on trucks for shipping worldwide.



HEALTH AND SAFETY OF WORKERS:

The company is complained on European and national health and safety regulations.

The company ensures constant efforts to guarantee healthy workspaces through either periodic check on air pollution and workers medical health.

The company plans periodic training and information sessions about health and safety regulation for all its workers.

ENVIRONMENTAL PROTECTION:

The company is complained on European and national environmental regulations.

The company activity is authorized by an Integrated Environmental Authorization (AIA), according to IPPC European regulation. AIA requires strict commitments on air pollutant emissions, noise impact, waste management, energy and material consumption. AIA also requires to achieve the Best Available Techniques (BAT) levels in the whole production process to minimize the plant environmental impact.

Solar energy supply system is installed on the plant roof and allow to cover part of the total energy consumption.

TECHNICAL DATA:

"TILES 6,4 -7" mm" BIII for internal wall.

The products meet the requirements defined by the European standard UNI EN 14411:2016 (Annex L Requirements for dry-pressed ceramic tiles of Group BIII), according to the criteria established by the ISO 10545 testing methods outlined below

DRY -PRESSED CERAMIC TILES, WITH WATER ABSORPTION $E_b > 10\%$ FOR INTERNAL WALLS FINISHES

UNI EN 14411:2016 - GROUP BIII ANNEX L GL	STANDARD OF TEST	VALUE	REQUIRED VALUE UNI EN 14411:2016
WATER ABSORPTION (% by mass)	UNI EN ISO 10545-3	$> 10\%$ $< 20\%$	AVERAGE $> 10\%$ When the average exceeds 20% this shall be indicated. Individual minimum value 9%
SURFACE QUALITY	UNI EN ISO 10545-2	$\geq 95\%$	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles
BREAKING STRENGTH for thickness $< 7,5$ mm	UNI EN ISO 10545-4	> 200	> 200 N
FLEXURAL TENSILE STRENGTH OR MODULUS OF RUPTURE for thickness $< 7,5$ mm	UNI EN ISO 10545-4	≥ 15	≥ 15 N/mm ²
THERMAL SHOCK RESISTANCE	UNI EN ISO 10545-9	Resistant	Pass according to EN ISO 10545-1
CRAZING RESISTANCE	UNI EN ISO 10545-11	Resistant	Pass according to EN ISO 10545-1
RESISTANCE TO HOUSEHOLD CHEMICALS AND SWIMMING-POOL SALTS	UNI EN ISO 10545-13	A	Minimum B
STAIN RESISTANCE GLAZED TILES	UNI EN ISO 10545-14	≥ 3	CLASSE 3 min

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to EN 14411:2012 Ceramic tiles – Definitions, classification, characteristics, evaluation of conformity and marking.

Annex K Requirements for dry-pressed ceramic tiles of Group BIII

BASE MATERIALS / ANCILLARY MATERIALS:

Main raw materials for ceramic tile:

- Clay 79%
- Rhyolite 17%
- Ceramic waste (internal) 3%
- Dust waste 1%

Main glaze components:

- Clay powder
- Quartz

- Alumina
- Natural pigments
- Frits
- Feldspar

Biogenic carbon content of product and packaging for 1m2 of ceramic tile		
Indicators		Unit
Biogenic carbon content in product		[kg]
Biogenic carbon content in packaging		[kg]
Caption	Biog. C in packaging = Biogenic carbon content in packaging; Biog. C in product = Biogenic carbon content in product	

PRODUCT PROCESSING/INSTALLATION

Tiles are fixed to the walls 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 US

Fire: In accordance with /EN 13501-1:2007+A1:2009/, ceramic tiles can be classified as fire resistance class 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 m² ceramic tiles for covering walls. The mass of the surface considered is average 11,2 kg/m²

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.

Environmental Impact indicators for 1m ² of ceramic tile														
Indicators	Unit	A1	A2	A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP total	[kg CO ₂ eq.]	3,19E+00	3,89E-01	3,18E+00	4,06E-01	2,60E+00	0	1,18E-02	0	1,11E-02	5,17E-02	3,06E-02	7,79E-02	-1,43E-01
GWP fossil	[kg CO ₂ eq.]	3,17E+00	3,73E-01	3,76E+00	3,88E-01	1,81E+00	0	8,90E-03	0	1,06E-02	4,94E-02	3,07E-02	7,74E-02	-1,42E-01
GWP biogenic	[kg CO ₂ eq.]	1,85E-02	1,64E-02	-5,79E-01	1,77E-02	7,89E-01	0	2,85E-03	0	4,87E-04	2,25E-03	-3,17E-04	2,17E-04	-5,78E-04
GWP luluc	[kg CO ₂ eq.]	7,57E-04	2,41E-05	5,78E-04	2,47E-05	9,99E-04	0	1,34E-06	0	6,67E-07	3,15E-06	2,35E-04	2,44E-04	-8,40E-05
ODP	[kg CFC-11 eq.]	3,06E-11	1,71E-13	1,28E-12	4,65E-14	5,89E-12	0	4,19E-14	0	1,25E-15	5,92E-15	5,22E-14	2,00E-13	-1,14E-12
AP	[Mol of H ⁺ eq.]	5,45E-03	1,34E-03	1,39E-03	4,19E-04	2,61E-03	0	1,55E-05	0	5,33E-05	7,41E-05	1,63E-04	5,57E-04	-2,68E-04
EP - freshwater	[kg P eq.]	5,74E-06	1,01E-07	1,17E-06	9,52E-08	8,73E-06	0	3,56E-06	0	2,57E-09	1,21E-08	1,06E-07	1,58E-07	-3,98E-07
EP - marine	[kg N eq.]	1,57E-03	6,24E-04	6,30E-04	1,43E-04	9,61E-04	0	1,75E-05	0	2,53E-05	2,96E-05	7,47E-05	1,44E-04	-8,77E-05
EP – terrestrial	[Mol of N eq.]	1,72E-02	6,92E-03	7,00E-03	1,62E-03	1,08E-02	0	4,59E-05	0	2,77E-04	3,26E-04	8,26E-04	1,58E-03	-9,52E-04
POCP	[kg NMVOC eq.]	4,79E-03	1,26E-03	1,87E-03	3,96E-04	2,20E-03	0	1,94E-05	0	7,15E-05	7,08E-05	2,03E-04	4,34E-04	-2,75E-04
ADPe	[kg Sb eq.]	4,20E-05	5,15E-09	4,09E-06	4,87E-09	5,84E-06	0	3,96E-10	0	1,31E-10	6,21E-10	3,34E-08	3,63E-09	-1,11E-08
ADPf	[MJ]	9,07E+01	5,53E+00	4,08E+00	5,65E+00	1,41E+01	0	1,98E-01	0	1,52E-01	7,20E-01	6,14E-01	1,05E+00	-2,99E+00
WDP	[m ³ world eq.]	5,03E-01	1,97E-03	7,56E-02	9,46E-04	1,32E-01	0	1,56E-03	0	2,55E-05	1,21E-04	6,07E-03	8,62E-03	-1,00E-02
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 1m ² of ceramic tile														
Indicators	Unit	A1	A2	A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PERE	[MJ]	1,46E+01	7,29E-02	5,54E+00	3,65E-02	0	0	2,42E-02	0	9,84E-04	4,65E-03	5,71E-02	1,70E-01	-6,97E-01
PERM	[MJ]	0	0	5,03E-01	0	-5,03E-01	0	0	0	0	0	0	0	0
PERT	[MJ]	1,46E+01	7,29E-02	6,05E+00	3,65E-02	4,27E+00	0	2,42E-02	0	9,84E-04	4,65E-03	5,71E-02	1,70E-01	-6,97E-01
PENRE	[MJ]	9,08E+01	5,55E+00	3,99E+00	5,67E+00	1,43E+01	0	1,98E-01	0	1,53E-01	7,23E-01	6,16E-01	1,05E+00	-3,00E+00
PENRM	[MJ]	0	0	9,29E-02	0	-9,29E-02	0	0	0	0	0	0	0	0
PENRT	[MJ]	9,08E+01	5,55E+00	4,08E+00	5,67E+00	1,42E+01	0	1,98E-01	0	1,53E-01	7,23E-01	6,16E-01	1,05E+00	-3,00E+00

SM	[kg]	0	0	7,90E-02	0	5,13E-03	0	0	0	0	0	0	0	1,19E+01
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	[m³]	1,38E-02	1,05E-04	2,62E-03	4,24E-05	4,18E-03	0	5,62E-05	0	1,14E-06	5,41E-06	1,75E-04	2,64E-04	-6,06E-04
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														
Indicators	Unit	A1	A2	A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
HWD	[kg]	2,71E-07	2,62E-11	5,45E-10	1,04E-11	1,79E-08	0	1,03E-11	0	2,82E-13	1,33E-12	-1,59E-12	2,28E-11	-1,22E-10
NHWD	[kg]	5,05E-01	5,87E-04	1,59E-02	5,65E-04	8,94E-01	0	6,04E-03	0	1,52E-05	7,20E-05	1,62E-04	5,23E+00	-4,94E-01
RWD	[kg]	1,30E-03	5,32E-05	9,79E-05	9,46E-06	3,01E-04	0	4,49E-06	0	2,55E-07	1,20E-06	8,26E-06	1,19E-05	-1,40E-04
CRU	[kg]	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	[kg]	0	0	9,68E-03	0	1,91E-02	0	0	0	0	0	1,22E+01	0	0
MER	[kg]	0	0	0	0	1,33E-01	0	0	0	0	0	0	0	0
EEE	[MJ]	0	0	0	0	3,80E-01	0	0	0	0	0	0	0	0
EET	[MJ]	0	0	0	0	5,80E-01	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													

Additional Environmental Impact Indicators for 1m ² of ceramic tile														
Indicators	Unit	A1	A2	A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PM	[Disease incidences]	5,90E-08	8,06E-09	8,35E-08	2,93E-09	7,43E-08	0	1,43E-10	0	6,06E-10	1,01E-09	3,09E-09	6,85E-09	-8,44E-09
IRP	[kBq U235 eq.]	2,03E-01	7,97E-03	1,22E-02	1,40E-03	3,66E-02	0	6,71E-04	0	3,76E-05	1,78E-04	1,33E-03	1,38E-03	-2,18E-02
ETF-fw	[CTUe]	1,49E+01	3,80E+00	1,96E+00	4,07E+00	4,53E+00	0	2,19E-01	0	1,10E-01	5,19E-01	4,09E-01	5,66E-01	-9,47E-01
HTP-c	[CTUh]	8,85E-10	7,09E-11	8,66E-10	7,48E-11	3,63E-10	0	1,84E-11	0	2,02E-12	9,54E-12	9,01E-12	8,79E-11	-7,56E-11
HTP-nc	[CTUh]	6,11E-08	2,29E-09	6,85E-08	2,41E-09	3,53E-08	0	1,70E-09	0	6,52E-11	3,07E-10	3,28E-10	9,28E-09	-5,77E-09
SQP	[Pt]	1,14E+01	7,14E-02	6,89E+01	3,53E-02	1,80E+01	0	1,74E-02	0	9,53E-04	4,50E-03	1,65E-01	2,54E-01	-5,61E-01
Caption	PM = Particulate matter emissions; IR = Ionizing radiation, human health; ETF-fw = Eco-toxicity (freshwater); HTP-c = Human toxicity, cancer effects; HTP-nc = Human toxicity, non-cancer effects, SQP = Soil quality potential/ Land use related impacts													

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

The functional unit for this study is 1 m² of an average installed ceramic tile produced by Exportceram Fideuro S.p.A. covering walls and floors in accordance with the normative constraints in terms of installation for 50 years (BNB (2011)).

Packaging material for transport to the installation site (plastic, paper-cardboard, wood, and wax) and additional material for the installation (adhesive mortar) have been considered. Material losses of 6,5% during the installation process (A5 phase) have been considered, so 1 m² of tile surface is the net of material losses.

REFERENCE FLOW:

Name	Value	Unit
Declared unit	1	m ²
Grammage	11,2	kg/m ²
Conversion factor to 1 kg	0,09	-

ASSUMPTIONS:

Where it is not possible to know the precise composition of materials in the supply chain (due to commercial or industrial confidential suppliers' reasons or due to missing datasets), these are approximated with LCIs of similar materials, estimated by the combination of available datasets or reconstructed with literature data. In most cases, a conservative approach has been adopted, overestimating burdens to prove irrelevance. In other cases, proxy data were selected based on scientific experience, to improve the accuracy of the model.

Some materials, like colorants, glaze compounds, inks, and frits, have been used based on composition (instead, for instance, of the single composition of a single colorant) using primary data in terms of absolute quantity and relative percentage of single chemical compound. For these kinds of materials, belonging to the same family (colorant, serigraphy, etc.) where a technical datasheet is not available, the same composition of the other materials of that family compound has been assumed.

Chemical additives have been modelled using compositions available in technical data sheets (in certain safety data sheets).

Quantities of auxiliary materials and packaging of input materials have been estimated according to waste produced by the company of the working group (e.g., lubricating oil, paper/cardboard, wood, plastic packaging, etc). The exact chemical composition of detergent components used for cleaning ceramic tiles depends on user behaviour and the selected supplier. The following assumptions are applied in the current study concerning the composition of detergents:

- Detergents for ordinary cleaning in a water solution are mixed as reported below according to Müller, F. J. (2003):
 - 5% anionic surfactant component: alcohol ethoxy sulfate,
 - 10% non-ionic surfactant component: fatty acid derivate.

For those processes that take place in Italy, electricity Italian residual grid mix was used, instead for those processes for which the place is unknown electricity RER residual grid mix was used.

Below are the emission factors considered for the energy related to production:

- Electricity = kg GWPeq./kWh
- Natural gas = kg GWPeq./MJ

CUT-OFF CRITERIA:

All known inputs and outputs were considered.

DATA QUALITY:

Geographical, temporal and technological representativeness of primary data:

- **Geographical:** All primary data are collected specifically for the countries/regions studied. Some secondary data represent the German industrial framework or an average European situation. The most important secondary processes for this study, thermal and electrical energy, specifically represent Italian geographical conditions. Processes for which the manufacturing location is unknown (e.g. grinding of some raw materials) use the generic EU28 electricity grid process. When country- or region-specific data are not available, surrogate data are used. Geographical representativeness is considered good.
- **Temporal:** All primary data are collected for 2022 as the reference year. All secondary data come from the LCA for Expert 2023.2 databases and are representative of the years 2018-2022. Temporal representativeness is good.
- **Technological:** All primary and secondary data are modelled to be specific to the technologies or technology mixes studied. When technology-specific data are not available, surrogate data are used. Technological representativeness is considered good.

PERIOD UNDER REVIEW:

The primary data collected in the study refer to 2022.

ALLOCATION:

For all refinery products, the allocation in terms of mass and net calorific value was applied. Two allocation rules are applied:

1. The raw material consumption (crude oil) of the respective steps, which is required for the production of a product or intermediate, is allocated according to the energy (mass of the product * calorific value of the product);
2. The energy consumption (thermal energy, steam, electricity) of a process, e.g. atmospheric distillation, which is required by a product or intermediate, is allocated to the product according to the share of the step's throughput (mass allocation).

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 subsequently implemented in the PCRB of the IBU program operator "Ceramic tiles and panels".

Transport (A4):

The environmental costs of transporting the packaged product from the production site to the construction site in Italy and Europe are allocated to Module A4. Having no specific information about the distances of the product's distribution, it was decided to follow what is indicated in **NF EN 15804+A2/CN (2022)**. The transportation settings are:

Distribution	Dataset	Distance [km]
National (Italy) – 42,76 % of tiles sold	Truck-trailer, Euro 6 A-C, 34 - 40t gross weight / 27t payload capacity (with a consumption of 2,11E-03 kg diesel/kg)	300
Intracontinental (Europe) – 44,12 % of tiles sold		1390
International – 13,12 % of tiles sold	Bulk commodity carrier, average, deep sea (with a consumption of 1,37E-04 kg HFO/kg)	6520

Installation into the building (A5):

The installation stage options were based on average data from different manufacturers of ceramic tiles in Europe to define which kind and the amounts of materials used EN 17160:2019. For this study, it is assumed that the tiles are installed using 6 kg of cementitious adhesive per 1m² of tile, on a worst-case scenario approach. The three options indicated in the EN 17160:2019 were compared based on the total score using the EF3.0 methodology. What emerged is that option 3 (cementitious adhesive) is 10% more impactful than option 2 (mortar, dispersion adhesive and polysulfide) and 70% more impactful than option 1 (mortar and water).

During the installation, there is an average tile scrap production of 6,5%, which is considered in module A5, as well as all the impacts generated by the production of the scrap.

For the treatment of packaging waste, the most updated European average scenarios (Eurostat 2020) are used:

Disposal scenarios for packaging materials			
Material	Recycling (%)	Energy recovery (%)	Landfill (%)
Plastic	37,6	38,2	24,2
Paper and board	81,5	9,1	9,4
Wood	31,9	38,9	39,2
Glue-wax*	-	-	100

* Since there are no specific Eurostat statistics for glue or wax packaging, it was decided to consider an end-of-life of 100% landfill, using a conservative approach.

Maintenance (B2):

Over the use modules (B1-B7), only the maintenance module (B2) is considered to generate environmental impacts. During the ceramic tile life cycle, the product has to be regularly cleaned, 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. Thus, the consumption of water

and disinfectant chemicals has been taken into account. This scenario is modelled based on EN 17160:2019. The scenario is made as follows:

Name	Value	Unit
Detergent	0,13	ml/m ²
Water	0,2	l/m ²
Cleaning times in 1 year according to periodicity	26	Done once every two weeks
RSL	50	years
Electricity	-	kWh

Use, repair, replacement and refurbishment (B1, B3, B4, B5):

As ceramic tiles are inert materials that do not generate emissions to air, water, or soil during normal use conditions, and since the service life of ceramic tiles is the same as the building's lifetime, use, repair, replacement, and refurbishment are not required for ceramic tiles.

Operational energy and water use (B6, B7):

These modules are not relevant for ceramic tiles.

End of life (C1-C4):

The EoL phase starts with the demolition process used for representing the C1 module, where the building deconstruction takes place. This process considers 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. After the demolition stage, ceramic tiles can be crushed and then used in several applications different from ceramic tiles production:

- Road construction in filled embankment;
- Concrete aggregates;
- Aggregates that can be integrated as partial substitutes for natural aggregate in hot mix asphalt;
- Aggregates which can be used in the construction of landfills;

After the demolition, ceramic tile is transported to the end-of-life processing; this is the C2 module and it is considered an average distance of 30 km.

The product's end-of-life scenario includes:

- 70% of the product sent for recycling;
- 30% of the product sent to landfill.

The worst-case scenario (landfilling) is modelled by the landfill process where admixtures end their life cycle and no credit allocated to module D is considered. The dataset used for the landfill considers 100 years of deposit.

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

Module D comprises credits from the recycling of packaging and energy credits from the thermal recovery of packaging. For the treatment of packaging waste, the most updated European average scenarios are used (Eurostat 2020):

Material	Recycle (%)	Incineration with energy recovery (%)	Landfill
Plastic	37,6	38,2	24,2

Paper and cardboard	81,5	9,1	9,4
Wood	31,9	38,9	39,2
Wax	-	-	100

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

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). **Exportceram Fideuro** 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

Exportceram Fideuro 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. The documentation must be compliance 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 (TiO₂) 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.

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 through 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 company 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

1.6 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 Exportceram Fideuro (MJ/kg powder)
Dryer and firing	5,5	< 5,5

1.7 CO₂ emissions

The specific CO₂ 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 Exportceram Fideuro (kgCO ₂ /ton powder)
Dryer and firing	360	< 360

1.8 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 for the same purpose. Only the wastewater included as part of the sludge made by the wastewater treatment is sent for recycling in others ceramic tiles plants. As a result, the facility does not discharge any industrial wastewater to third-party companies or bodies of water and maintains water recycling rates at 100%. This ensures the lowest possible impact on its water consumption.

1.9 Air pollutant emissions

The specific emissions of dust, HF and NO_x, 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 for firing process	Mandatory limit (mg/kg)	Measured emission Exportceram Fideuro (mg/kg)
Dust	50	< 50
HF	20	< 20
NO _x	250	< 250

1.1 Wastewater management

The plant has a closed-loop recycling system for wastewater treatment, allowing zero liquid discharge. Wastewater from washing the plants is treated and reused for the same purpose. The plant does not discharge industrial wastewater to third parties or into water bodies, achieving a water recycling rate at 100%, minimizing the impact on water consumption.

2.1 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 recycled: mainly is incorporated into the production process at the site and the rest in others ceramic tiles plants.

3.1 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. Since 80's the company use only lead-free glaze ingredients.

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