EPD

CERTIFICATION

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RUSHMORE COLLECTION

ENVIRONMENTAL PRODUCT DECLARATION

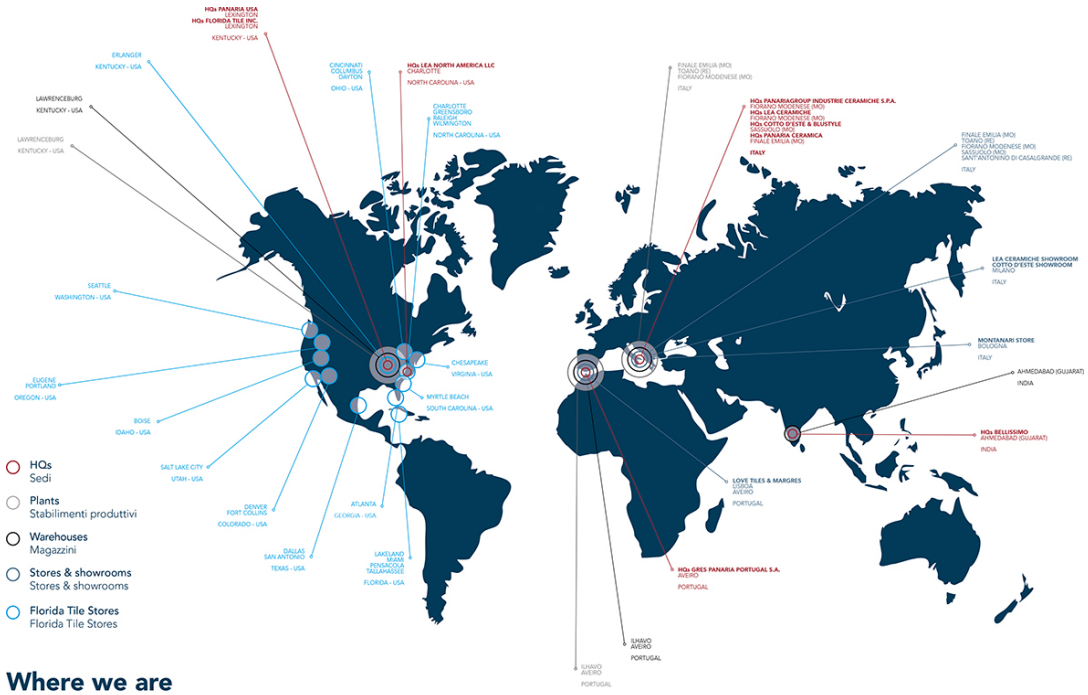
Product Name: "PORCELAIN STONEWARE"
Site Plant: "TOANO (RE) - ITALY"
in compliance with ISO 14025 and EN 15804

Program Operator	EPDItaly
Publisher	EPDItaly
Declaration Number	EPD 002 PGR ver.1
EPDItaly Registration Number	EPDItaly0051
ECO-EPD Registration Number	00000801
Issue Date	25/11/2018
Valid to	24/11/2023

SECTION 1 - GENERAL INFORMATION

EPD OWNER:	Panariagroup Industrie Ceramiche SpA, via Panaria Bassa n. 22/A, 41034 Finale Emilia (MO), ITALY
PLANTS INVOLVED IN THE EPD:	Plant of Toano/Fora di Cavola, via dell'Industria n. 15, 42010 Toano (RE), ITALY
FIELD OF APPLICATION:	The ceramic slabs object of this study are intended to be applied to both floor and wall claddings and to be installed both indoors and outdoors for residential, non-residential and commercial use.
PROGRAM OPERATOR:	EPDITALY, via Gaetano De Castillia n. 10, 20124 Milano, Italy.
EXTERNAL AUDIT:	ICMQ, via Gaetano De Castillia n. 10, 20124 Milano, Italy. *External audit of the declaration and data performed according to ISO 14025:2010.*
CPC CODE:	37370
COMPANY CONTACT:	Enrico Mantovani - Panariagroup Industrie Ceramiche SpA, via Panaria Bassa n. 22/A, 41034 Finale Emilia (MO), ITALY email enrico.mantovani@panariagroup.it
TECHNICAL SUPPORT:	Thinkstep Italia, via Bovini n. 41 Ravenna (IT) www.thinkstep.com
COMPARABILITY:	The comparison of the results of this EPD declaration with other studies and documents is only possible if all the data sets (database) to be compared have been created according to EN 15804 and if the same building context is taken into consideration, i.e. the specific performance characteristics of the product. Environmental statements published within the same product category, but originating from different Program Operators and created with different PCR specifications may not be comparable.
LIABILITY:	Panariagroup relieves EPDItaly from any failure to comply with the environmental legislation self-declared by Panariagroup. The holder of the declaration will be responsible for the information and supporting evidence; EPDItaly disclaims any liability with regard to the manufacturer's information, data and life cycle assessment results.
REFERENCE DOCUMENT:	This declaration is based on the EPDItaly regulation, available on the website www.epditaly.com
PRODUCT CATEGORY RULES (PCR):	PCR ICMQ-001/15 rev2 IBU PCR Parte B:30-11-2017 V1.6 The EN 15804 standard constitutes the framework reference for the PCR

SECTION 2 - THE COMPANY



Where we are

Dove siamo

THE STORY OF PANARIAGROUP

Ceramica Panaria began as an industrial company in 1973, with the purchase of the land that now houses the Finale Emilia production facilities (province of Modena).

In 1976 the company was founded and the first two production lines were installed and tested and in December the first tiles were produced. Full capacity production was reached in 1977. In the late eighties, the old kilns were replaced with single-layer roller kilns, which were more efficient and had greater productivity. At the same time, the presses were renewed, with more powerful machines capable of faster production cycles.

In 1990 Panariagroup upgraded its production from red single firing to white single firing production using mixtures of the finest clays.

In 1992 the ceramics firm Lea based in Fiorano Modenese was acquired, consisting of two kilns, one for flooring and one for wall-cladding.

In 1993 the Cotto d'Este brand was launched, a company marketing products of the very highest quality, employing production methods with the very best technical and aesthetic characteristics. Initially, the products were white body single-fired, and subsequently they were also made in Porcelain Stoneware.

In 1995 work began on the construction of a new production site in Fora di Cavola, in the municipality of Toano (province of Reggio Emilia), for the production of Porcelain Stoneware. Initially two kilns were put into operation, later (in 1999) this number would rise to three, with an atomizer and a continuous mill for the grinding of raw materials.

In 1996 the Fiordo brand was born, a company marketing products made exclusively of Porcelain Stoneware.
In 2000, with the construction of new installations for the third atomizer and a continuous grinding mill, as well as the installation of new kilns, the production of Porcelain Stoneware also began at the Finale Emilia plant.
In 2002 the Panaria group is expanded, incorporating the Company Maronagrès, a leading Portuguese ceramics manufacturing company, leader in the production of technical porcelain stoneware.
In 2004 Panaria Industrie Ceramiche S.p.A. changed its company name, maintaining its registered office, to Panariagroup Industrie Ceramiche S.p.A. incorporating the Cotto d'Este Companies - Antica Ceramica d'Arte S.p.A., Fiordo Industrie Ceramiche S.p.A., Ceramiche Artistiche Lea S.p.A. and GMG S.r.l. which maintained their administrative offices.
2004 is the year in which Panariagroup decided to go public and on 19 November, 2004, the Group was listed in the Star segment of the Italian Stock Exchange.
In December 2005 Panariagroup acquired 100% of Novagrès S.A., a leading Portuguese company in the production and distribution of ceramic material for floors and walls.
In February 2006 Panariagroup acquires the brand and the main assets of Florida Tile Industries Inc., a well-known US company specializing in the production and distribution of ceramic material for floors and walls in the US market.
In October 2007, Panariagroup acquired the company Montanari S.r.l., a retail outlet for ceramic materials and complementary products based in Crespellano (BO).
In November 2008 an important restructuring phase began at the Fiorano plant, which involved the installation of a production line for a technologically innovative product called "Laminated Porcelain Stoneware" consisting of slabs measuring 1000x3000 mm and with a thickness of 3 mm. The project involved the total replacement of a production line (the first installed at the plant) consisting of machines used to produce glazed porcelain stoneware.
In May 2010 a new division was created within the Group called Panariagroup Trade, which deals with business development in the regions of the Middle East, Far East and Oceania, marketing the products of the Panaria, Cotto d'Este, Lea and Fiordo brands.
In May 2012 a Joint Venture Company (JVC) was set up in Ahmedabad, in the Indian state of Gujarat, a company 50% owned by Panariagroup and 50% by Asian Granito India Ltd. The JVC products are sold on the Indian market with the new "Bellissimo - STILE ITALIANO" brand owned by Panariagroup.
In May 2012 Emilia Centrale was hit by violent earthquakes with peaks on the 20th and 29th with a magnitude 5.9 and 5.8 respectively on the Richter scale, the first with its epicentre in Finale Emilia; the Panariagroup No.1 production site suffered significant damage some production lines and buildings. Immediate reparation works were organized and after only three months the plants returned to full production.
In January 2016, the installation of the third complete line for the production of Laminated Porcelain Stoneware was completed at the Fiorano plant.
Panariagroup currently has a structure that includes 6 production plants (3 in Italy, 2 in Portugal, 1 in the United States) and 3 logistics hubs (2 in Italy and 1 in the United States).
The group employs around 1600 people, and produces about 20 million m^2 of tiles each year.

TOANO PRODUCTION SITE

The Panariagroup production site began operation in January 1996 in the "Fora di Cavola" industrial area, located in the Reggio Apennines in the municipality of Toano in the province of Reggio Emilia.
The site currently covers a total area of 115,000 m^2, of which 35,000 m^2 are covered and 80,000 m^2 are uncovered. The covered area includes production areas and warehouses. The uncovered surface, with the exception of a green area of 2,000 m^2, is paved, and part of this, covering an area of about 35,000 m^2, is used as a finished product warehouse.
The south-east and south-west sides of the facilities border the SP 19 which leads to Castelnovo ne Monti, while to the north-west the site borders Torrente Secchiello and to the north-east the industrial zone "Fora di Cavola".
The annual production of glazed and unglazed tiles is currently around 5,000,000 m^2, with a staff of around 180.

SECTION 3 - OBJECTIVE AND SCOPE OF THE EPD

The entire life cycle of the product (type of EPD: « **cradle-to-grave** ») and the Modules described below are considered:

*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.*

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

*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. For this reason Modules B3-B4-B5 are not considered.*

*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** is not relevant for the environmental impacts, as it regards demolition and de-construction process of the tiles from the building.*

*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 (Module 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

TYPE OF EPD:

Refers to the "PORCELAIN STONEWARE" product manufactured by PANARIAGROUP at the TOANO (RE) - ITALY production site.

GEOGRAPHICAL VALIDITY:

Performance has been calculated in reference to the plant in "TOANO" (RE) - ITALY.
The reference market is "global".

DATABASE USED:

GaBi 2018 SP36

SOFTWARE:

The EPD process is implemented using the GaBi professional 8.7 and GaBi envision 3.0 software.
The identification code of the EPD process tool used is: EPD Tool Creator for Ceramic Tile - V5.

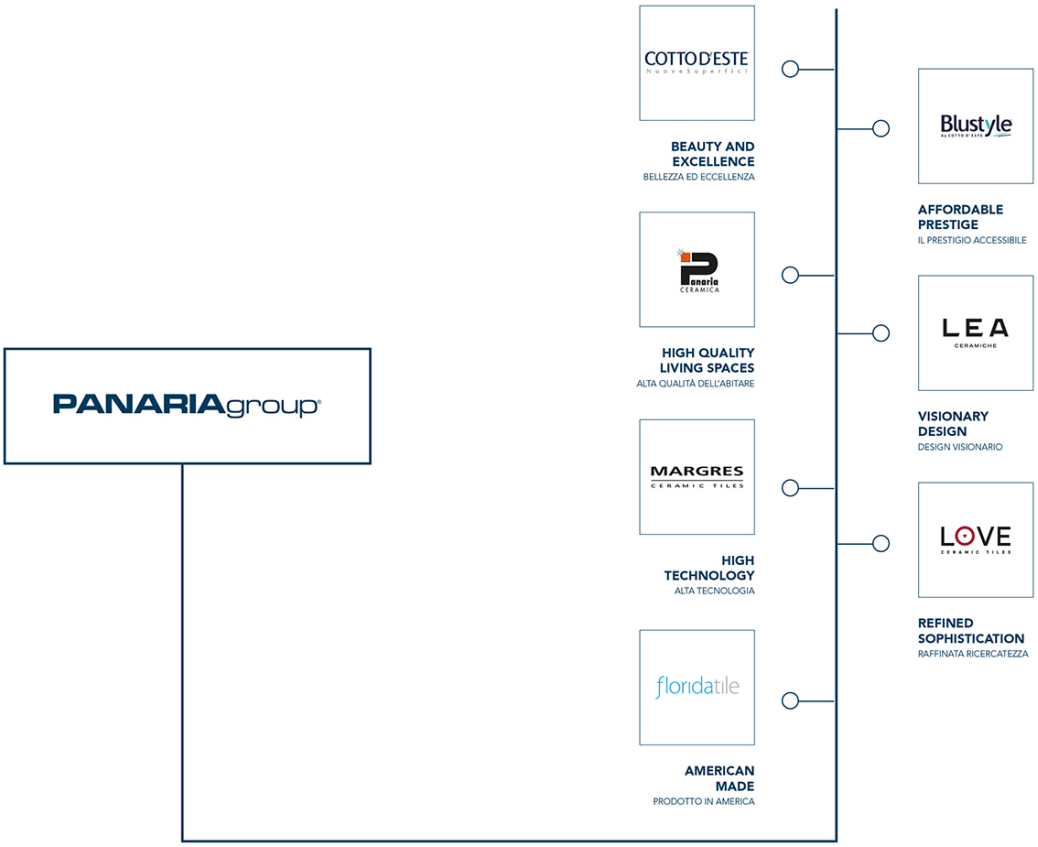
EPDs PERFORMED WITH VALIDATED CALCULATION ALGHORITM:

In 2018 Panariagroup Industrie Ceramiche has implemented and certified a Process for the generation of EPDs through the use of a calculation algorithm validated and certified by ICMQ S.p.A., in accordance with the requirements of EPDItaly. The process is based on an automatic data collection at the plants, subsequently integrated, verified and validated in accordance with internal procedures. The validated calculation algorithm allows the automatic generation of EPDs for the "PORCELAIN STONEWARE" product manufactured at the TOANO (RE), Italy production site.
This EPD was automatically generated for the selected product or products, in order to evaluate the environmental impacts in relation to their specific use.

SECTION 4 - DETAILED PRODUCT DESCRIPTION

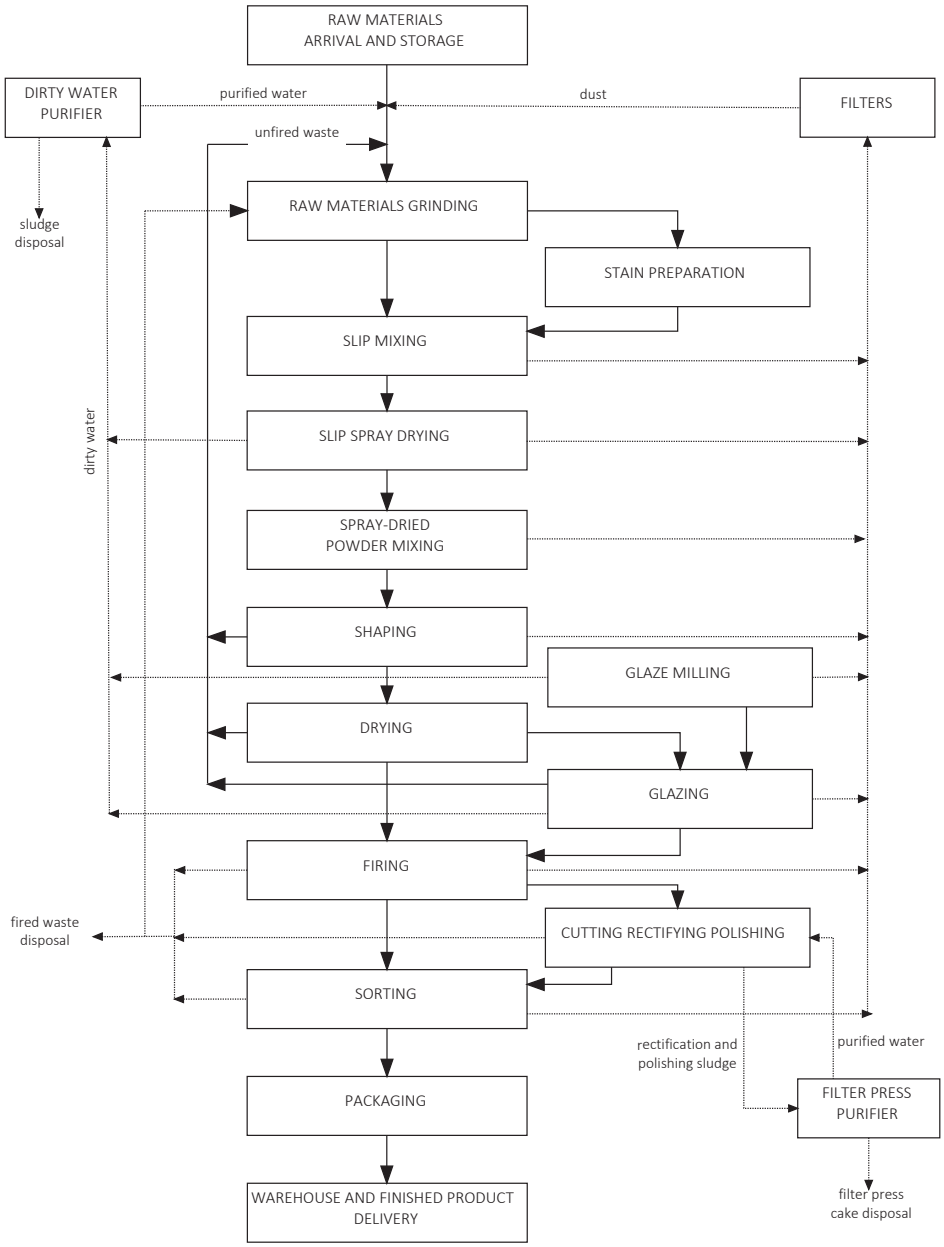
The Panariagroup site in Toano (RE) is dedicated to the production of "Porcelain stoneware" that is mainly used for flooring and wall cladding. The products are distributed by the Commercial divisions of the group's brands

- BLUSTYLE
- COTTO D'ESTE
- LEA CERAMICHE
- PANARIA CERAMICA
- LOVE TILES
- MARGRES CERAMIC TILES
- FLORIDA TILE
- PANARIAGROUP



DESCRIPTION OF THE PRODUCTION PROCESS

The production process of the ceramic tile covered by this EPD is shown below and described.

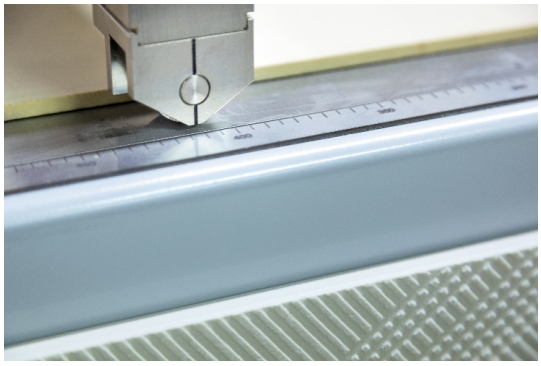


The cycle illustrated in the flowchart is divided into a series of operations and activities that are carried out consecutively. The individual phases of the production cycle are generally associated with a specific department, appropriately identified within the plant.

The raw materials (clays, feldspar, kaolins, sands, pigments, ...), chosen in such a way as to give the mixture high mechanical strength, an appropriate vitrification temperature and a constant shrinkage, arrive at the plant and are stored in special areas in the raw materials warehouse.

The first phase of the process begins with the automated dosage of the raw materials that make up the various types of mixture.
The raw materials are wet milled, that is with the addition of water, in high powered continuous and discontinuous mills with significant power to obtain a liquid mixture with an aqueous fraction of about 30%, referred to as "ceramic slurry" in the ceramics sector. Before the atomisation process the "ceramic slurry" can be coloured by mixing it with concentrated coloured inorganic oxides (pigments) previously ground.
The ceramic slurry obtained is pumped into spray driers, called "Atomisers"; here it is nebulised in special nozzles to obtain very fine droplets of different sizes which, when passed through a flow of air heated to about 600 °C, generate the "atomised" mixture of granules with controlled humidity and with appropriate granulometric distribution to obtain the ideal compaction of the powders in the subsequent pressing phase.
A large silos battery is set up for the storage of the various coloured powders, which will then be sent to the mixing and pressing phases.

The tile is formed through the compression of the atomised powders with very powerful hydraulic presses, which give it the shape (square, rectangular, strips, ...), the productive size, the thickness, the surface type (smooth, structured, ...), the shape of the edges (straight, rounded, split like stone, ...).
The tile formed in this way is transported from the presses to the drying kilns where it undergoes a drastic reduction in humidity and a decisive increase in “raw” mechanical strength, both factors that are necessary before undergoing the subsequent production phases. Generally, the drying process lasts 20-30 minutes at maximum temperatures of 200-220 °C.
The pressed tiles can be subjected to glazing and digital decoration applications, which give the product high-end aesthetic effects and colouring, similar to those of natural materials (stones, marbles, wood, etc ...).



The firing phase is carried out in industrial kilns that, thanks to sophisticated flame emission systems, make it possible to keep the temperature uniform in all the zones of the kilns, eliminating problems of varying tonalities and firing. The long periods spent at high firing temperatures (cycles up to 100 minutes at maximum temperatures of 1200-1220 °C) ensures the material achieves complete vitrification throughout its mass: thus obtaining ceramic tiles with almost zero porosity, which are therefore completely frost resistant, with considerable mechanical strength (breaking strength, resistance to bending, abrasion, scratches) and resistance to aggressive chemicals.

Before quality inspection, most of the material is subjected to mechanical processing, such as cutting (to obtain smaller sizes), rectification (to obtain tiles with highly linear and orthogonal sides, which allows installation with very narrow grout lines) and honing (mechanical abrasion of the surface with very high hard tools to obtain softer surfaces, pleasant to the touch, with different degrees of gloss).
In the quality inspection department each ceramic tile is checked with regards to:

- dimensions, flatness, orthogonality of the edges, using electronic readers set with tight tolerances;
- tonality and surface quality (absence of defects) through specialised operators and automatic selection machines.

The finished products are packaged in homogeneous batches by article, quality class, tone and "calibre", the boxes are then automatically placed on "debarked" pallet and treated according to FAO ISPM15 regulations.
Each pallet leaves the quality inspection department with a special pallet card glued on shrink-wrap, indicating for each article: code, description, format, selection class, tone, calibre, bar code (if required). The material, once loaded in the warehouse, is available to be used for customer orders. The management of the shipments takes place with a radio frequency system to minimise errors during shipping and obtain optimal warehouse management.

The Environmental Declaration and the Management System documents for Quality ISO 9001, Environment ISO 14001/EMAS and Safety (UNI-INAIL Guidelines) report all the information regarding the company's Quality, Environment and Safety controls/requirements/provisions for the production cycle.

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TECHNICAL DATA:

Technical feature	Average value	Unit of mesure
Water absorption according to ISO 10545-3	0,05	%
Breaking strength according to ISO 10545-4	≥ 1300	N
Modulus of rupture according to ISO 10545-4	50	N/mm^2
Resistance to wear abrasion (glazed ceramic tile) according to ISO 10545-7	Depending on product	Class
Linear thermal expansion according to ISO 10545-8	7×10^{-6}	1/K
Thermal shock resistance according to ISO 10545-9	Resistant	
Crazing resistance according to ISO 10545-11	Resistant	
Frost resistance according to ISO 10545-12	Resistant	
Antislip properties (R9, R10, R11, R12, R13 class) according to DIN 51130	Depending on product	Class
Antislip properties (A, B, C class) according to DIN 51097	Depending on product	Class
Adhesion strength according to EN 12004	Conforms	
Impact resistance according to ISO 10545-5	0.75-0.85	
Fire reaction	A1/A1fl	Class
Chemical resistance according to ISO 10545-13	LA (Resistant)	Class
Resistance to the household chemicals and swimming pool salts according to ISO 10545-13	A (Resistant)	Class
Stain resistance according to ISO 10545-14	Conforms	Class
Lead and Cadmium given off (glazed ceramic tile) according to ISO 10545-15	None (Resistant)	
Moisture expansion according to ISO 10545-10	0,0	mm/lm
Resistance to deep abrasion (unglazed ceramic tile) according to ISO 10545-6	145	mm^3

The Panariagroup products manufactured at Toano have achieved the following product certifications for Quality (QB-UPEC, KEY Mark-UNI Certiquality), Environment (Floorscore) and Safety (CE, CCC).

The Quality/Environment and Safety Integrated Management System of this production site is certified according to ISO 9001:2015, ISO 14001:2015, EMAS and UNI-INAIL Guidelines.

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BASE MATERIALS / ANCILLARY MATERIALS

Main raw materials for ceramic tile:

- Clay 20-40 %
- Caolin 0-12 %
- Feldspar 20-40 %
- Sand 15-30 %
- Pigments 0-4 %

Main glaze components:

- Clay Powder
- Quartz
- Alumina
- Pigments
- Frits
- Feldspar

Main auxiliary additives:

- Dispersant
- Binder
- Fluidifying agents

INSTALLATION/LAYING:

The tiles are fixed to the surfaces of walls and floors using specific materials and in different quantities, for example dispersion adhesives, cementitious adhesives and mortar, sealants or applied liquid membranes. No emissions are generated during installation and ceramic tile installations do not cause health or environmental hazards.

FUNCTIONAL UNIT AND REFERENCE FLOWS:

The functional unit is 1 m^2 of ceramic tiles for wall and floor covering, for a period of 60 years. The mass of the considered area is on average 25.1 kg/m^2.

REFERENCE SERVICE LIFE (RSL):

The service life of the tiles is generally more than 50 years (BNB 2011). In addition, according to the US Green Building Council, the service life of the tiles could have the same service life as the building itself. Therefore, 60 years can be considered as a realistic service life for the tiles. The results reported take into account the use of the tiles for 1 year, by multiplying the B2 values by 50 or 60 it is possible to obtain B2 values for 50 or 60 years.
No RSL has been defined according to ISO 15686.

CONDITIONS OF USE:

Having been fired at high temperatures, ceramic tiles are robust and inert. The environmental impacts generated during phase B1 are very low and therefore not considered.

MECHANICAL DESTRUCTION:

Ceramic tiles can be mechanically crushed and no significant environmental impact is expected.

REUSE:

After the demolition and deconstruction phase, ceramic tiles can be crushed and used in a wide range of different applications, for example aggregates for concrete or road construction.

DISPOSAL:

According to the European Waste Catalogue (EWC), ceramic tiles belong to group 17 "Construction and demolition wastes", tiles and ceramics (code: 17 01 03)

SECTION 5 - RESULTS OF THE LCA

The following tables illustrate the results of the LCA (Life Cycle Assessment) study. Basic information on all declared modules can be found in chapter 3. It is possible to convert the results referring to kg using the following conversion factor 0.0398.

RESULTS OF THE LCA - ENVIRONMENTAL IMPACTS of 1 m² of porcelain tile (25.1 kg / m²)																
Parameter	Unit	A1-3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	[kg CO_2-eq.]	1,20E+01	6,66E-01	2,69E+00	0,00E+00	4,04E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,37E-02	5,21E-02	1,41E-01	-2,67E-01
ODP	[kg CFC11-eq.]	5,99E-11	2,43E-14	6,27E-12	0,00E+00	7,63E-12	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,90E-15	2,34E-14	3,18E-14	-7,52E-13
AP	[kg SO_2-eq.]	2,41E-02	5,49E-03	3,91E-03	0,00E+00	5,85E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,36E-04	3,72E-04	8,32E-04	-6,34E-04
EP	[kg PO_4^{3-}-eq.]	3,37E-03	6,11E-04	7,97E-04	0,00E+00	4,47E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,98E-05	8,95E-05	1,15E-04	-1,03E-04
POCP	[kg ethene-eq.]	1,83E-03	2,82E-04	3,06E-04	0,00E+00	6,56E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-9,27E-05	4,06E-05	6,47E-05	-6,76E-05
ADPE	[kg Sb-eq.]	7,75E-05	4,84E-08	9,11E-06	0,00E+00	1,33E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,71E-09	6,87E-08	5,40E-08	-1,06E-07
ADPF	[MJ]	1,87E+02	8,82E+00	2,00E+01	0,00E+00	3,46E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,46E-01	1,01E+00	1,82E+00	-4,62E+00
Caption	GWP = Global warming potential; ODP = Ozone depletion potential; AP = Acidification potential; EP = Eutrophication potential; POCP = Photochemical ozone creation potential; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources															

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RESULTS OF THE LCA - RESOURCE USE of 1 m² of porcelain tile (25.1 kg / m²)																
Parameter	Unit	A1-3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	3,92E+01	3,61E-01	1,48E+01	0,00E+00	1,87E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,23E-02	7,07E-02	2,33E-01	-1,78E+00
PERM	[MJ]	8,10E+00	0,00E+00	-8,62E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	4,73E+01	3,61E-01	7,25E+00	0,00E+00	1,87E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,23E-02	7,07E-02	2,33E-01	-1,78E+00
PENRE	[MJ]	1,94E+02	8,86E+00	2,25E+01	0,00E+00	3,67E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,49E-01	1,05E+00	1,89E+00	-5,40E+00
PENRM	[MJ]	1,40E+00	0,00E+00	-1,49E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	1,95E+02	8,86E+00	2,12E+01	0,00E+00	3,67E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,49E-01	1,05E+00	1,89E+00	-5,40E+00
SM	[kg]	2,15E+00	0,00E+00	1,40E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,80E+01
RSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m³]	5,49E-02	6,66E-04	7,49E-03	0,00E+00	2,84E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,65E-05	3,19E-04	3,60E-04	-1,31E-03
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															

EPD

tilebar

RESULTS OF THE LCA - OUTPUT FLOWS AND WASTE CATEGORIES of 1 m² of porcelain tile (25.1 kg / m²)																
Parameter	Unit	A1-3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	6,03E-04	3,58E-07	3,93E-05	0,00E+00	2,54E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,49E-08	3,40E-08	3,25E-08	-2,63E-08
NHWD	[kg]	1,36E+00	5,58E-04	1,91E+00	0,00E+00	5,72E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,95E-05	2,23E-04	8,85E+00	-8,36E-01
RWD	[kg]	3,26E-03	1,67E-05	4,97E-04	0,00E+00	8,51E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,30E-06	1,61E-05	2,73E-05	-3,12E-04
CRU	[kg]	0,00E+00	0,00E+00	1,90E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-
MFR	[kg]	0,00E+00	0,00E+00	1,38E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,06E+01	0,00E+00	-
MER	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-
EEE	[MJ]	0,00E+00	0,00E+00	6,60E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-
EET	[MJ]	0,00E+00	0,00E+00	9,78E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-
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; EET = Exported thermal energy															

TRACI INDICATORS:

According to UL, USA program operator.

TRACI indicators (version 2.1), from EPA's Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts http://www.epa.gov/nrmrl/std/traci/traci.html, are listed below:

TRACI INDICATORS: ENVIRONMENTAL IMPACTS of 1 m^2 of porcelain tiles (25.1 kg / m^2)									
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**C2**	**C3**	**C4**	**D**
Global Warming Air	[kg CO_2-eq.]	1,20E+01	6,66E-01	2,69E+00	4,04E-02	5,37E-02	5,21E-02	1,41E-01	-2,67E-01
Ozone Deplation Air	[kg CFC11-eq.]	6,02E-11	2,43E-14	6,29E-12	8,12E-12	1,90E-15	2,34E-14	3,18E-14	-7,52E-13
Acidificatio Air	[kg SO_2-eq.]	2,71E-02	5,82E-03	4,48E-03	8,71E-05	3,16E-04	4,98E-04	9,11E-04	-7,17E-04
Eutrophication	[kg N -eq.]	1,91E-03	2,56E-04	6,78E-04	8,87E-05	2,79E-05	3,61E-05	7,68E-05	-7,42E-05
Smog Air	[kg O_3 -eq.]	5,29E-01	1,07E-01	8,44E-02	1,31E-03	6,91E-03	1,65E-02	1,79E-02	-1,53E-02

SECTION 6 - CALCULATION RULES

FUNCTIONAL UNIT:

Name	Value	Unit of measure
Unit of measurement declared	1	m^2
Weight	25.1	kg/m^2
Conversion factor to 1 kg	0.0398	-

ASSUMPTIONS:

The modules from A5 to C4 are scenarios based on average data, included in the PCR created by the European Federation of ceramic tile manufacturers /CET PCR 2014/ and subsequently implemented in the PCRb of the IBU program operator "Ceramic tiles and panels v1.6".

EXCLUSION CRITERIA:

All flows in known inputs and outputs were considered.

DATA QUALITY:

The validity period of the background data from the Thinkstep database is between 2013 and 2017. Most of the information (energy and water consumption, emissions of pollutants, atomized powders 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 checked for each plant involved in this study. Carbon dioxide emissions (related to carbonate oxidation) are collected through the ETS (Emissions Trading Scheme) declaration.
Detailed data was obtained not only for mixtures of raw materials (collected with primary data from the company) but also for dyes, frits and other raw materials for glaze production.
The overall quality of the data can be considered optimal.

EXAMINATION PERIOD:

Primary data collected in the context of this study refer to 2017.

ALLOCATION:

The consumption of energy and materials has been allocated to the product in question based on the mass of ceramic tiles produced annually. No further allocations were applied in the modules subsequent to the production phase. Some ceramic waste is recycled internally. Credits for energy recovery of packaging materials and end of life of the product have been taken into consideration.

SECTION 7 - SCENARIOS

The following technical information concerning the declared modules and related scenarios are based on average data, in accordance with the "European Federation of Ceramic Tile Manufacturers" and subsequently implemented by the PCRb of the IBU program operator "Ceramic tiles and panels v1.6".

TRANSPORTATION (A4):

For transportation of distances of less than 300 km, the return journeys of the vehicles used are considered to be empty. Return journeys travelled by vehicles, over 300 km, are considered at full load. This assumption is applied for any type of transport present in the analyzed system.

INSTALLATION INTO THE BUILDING (A5):

For the installation stage 3 options are defined, where different materials can be used.
For option 1, adhesives, mortar and water, for option 2 mortar dispersion adhesives and polysulfides, for option 3 also cementitious adhesives (different quantities for different tile formats). These considerations are based on average data from different manufacturers of ceramic tiles in Europe. In this EPD it is assumed that the tiles are installed using cementitious adhesive (option 3).
For the treatment of packaging waste, a European average scenario is used and shown, taken from /"Eurostat, 2013"/; therefore the end of life is recycling, energy recovery and landfill, for plastic and paper, instead reuse, energy recovery and landfill for wood.
The ceramic material loss considered is 6,5%.

Option 3 (larze size tiles)	Value	Unit of measure
Cementitious adhesive	6	kg

USE (B1):

Ceramic tiles are robust and have a hard, abrasion-resistant surface.
There are no impacts on the environment during the use stage.

MAINTENANCE (B2):

Ceramic covering products shall be cleaned regularly, to a greater or lesser degree, depending on the type of building: residential, commercial, healthcare. Thus, the consumption of water and disinfectant has been considered. The values declared in this stage refer to a time period of 1 year.
Scenario for maintaining ceramic floor and wall tiles:
Residential use: 0,2 ml of detergent and 0,1 l of water are used to wash 1 m^2 of ceramic tiles once a week. This stage scenario is based on average data from different manufacturers of ceramic tiles in Europe.

Name	Value	Unit of measure
Water consumption	0,1	l
Detergent	0,2	ml
Floor tile maintenance cycle	2400	Number/LS
Wall tile maintenance cycle	200	Number/LS

REPAIR, REPLACEMENT AND REFURBISHMENT (B3, B4, B5):

In general the service life of ceramic tiles is the same as the building life time. Repair, replacement and refurbishment is 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):

C1: This module, according to the PCR developed by the European Ceramic Tile Manufacturers' Federation, is not relevant for ceramic tiles.

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 end-of-life scenario is described in the following table:

Name	Value	Unit of measure
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 tiles and packaging, energy credits from thermal recovery of the packaging.

REFERENCES

ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework

ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines

ISO 14020:2000 Environmental labels and declarations -- General principles

ISPRA (2014). Rapporto rifiuti urbani, edizione 2014. Istituto Superiore per la protezione e la ricerca ambientale. Roma, Italia 14040:2006, Environmental Management – Life Cycle Assessment – Principles and Framework.

EN 15804:2012+A1:2014 Sustainability of construction works – Environmental product declarations Core rules for the product category of construction works

EUROSTAT 2013 Statistiche sui rifiuti

GaBi LCA Database Documentation. Retrieved from Thinkstep AG: http://www.gabi-software.com/international/databases/gabi-databases/

IBU PCR Part B:30/11/2017 V1.6
Product Category Rules for Building-Related Products and Services.
Part B: Requirements on the EPD for Ceramic tiles and panels

PD CEN/TR 16970:2016 Sustainability of construction works – Guidance for the implementation of EN 15804

BS EN 16757:2017 Sustainability of construction works – Environmental Product Declarations – Product category rules for concrete and concrete elements

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

PD CEN/TR 15941:2010 Sustainability of construction works – Environmental Product Declarations – Methodology for selection and use of generic data

PCR ICMQ – 001/15 rev. 2 Prodotti da costruzione e servizi per costruzioni (EPD Italy, 2017).

US GBC: US Green Building Council, Leed v3, 2009, Whole building life cycle assessment. LEED BD&C v4 (LEED Building Design & Construction).