

ENVIRONMENTAL PRODUCT DECLARATIONS

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Porcelain Tiles

Programme:	EPD Turkey, a fully aligned regional programme www.epdturkey.org	The International EPD® System www.environdec.com
Programme operator:	EPD Turkey: SÜRATAM – Turkish Centre for Sustainable Production Research & Design Nef 09 B Blok No:7/15 34415 Kagıthane/Istanbul, TURKEY	EPD International AB Stockholm, Sweden
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TURKEY EPD®
ENVIRONMENTAL PRODUCT DECLARATIONS

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Product Category Rules (PCR): The International EPD® System's PCR 2012:01 Construction Products and Construction Services, Version 2.3, 2018-11-15 and Sub-PCR-L Ceramic Tiles EN 17160

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

EPD process certification EPD verification ✓

Third Party Verifier: Vladimír Kočí, PhD

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No ✓

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs of construction products may not be comparable if they do not comply with EN 15804.

COMPANY INFORMATION

Seranit was established in 1992 as the first “Technical Porcelain” manufacturer of Turkey and has been manufacturing ceramic and 100% porcelain tiles for both interior and exterior application. Seranit adds value to spaces with an innovative approach, rich color, effect and size range, and trend-setting designs. Today, Seranit continues production at their Bilecik Plant with a production capacity of 8.5 million sqm and Inönü/Eskişehir plant with a production capacity of 10 million sqm.

Never compromising on its principle to maintain its globally-recognized quality and to choose quality over price as a competition advantage with the goal of optimizing customer satisfaction since its foundation, Seranit has a respected place among porcelain manufacturers all over the world with its modern production technologies.

Seranit, the first technical porcelain manufacturer of Turkey, is the original producer of many generic brands such as Super White that were created after an in-house R&D and P&D process. Along with standard sizes, Seranit offers 60x60cm and 60x120cm technical porcelain sizes and became the first company to introduce 90x90cm and 90x135cm tiles to the industry in 2007.

Seranit R&D and Design Centers aim to design national and international projects, establish an expert infrastructure in the industry, create new cooperation opportunities and develop innovative products with high added value.

Attracting attention with trend-setting designs, Seranit is the preferred brand in projects with a rich product portfolio. Seranit is also capable of responding to product development needs rapidly thanks to the strong R&D and P&D departments.

The Seranit brand produces porcelain tiles and ceramic tiles.

Aiming to build a better and cleaner world for the next generations, Seranit produces environmentally-friendly products within the framework of an environmentally-friendly management mentality following national and international standards. As a holder of 14001 Environmental Management System Certificate, Seranit fulfills all environmental requirements by using the right raw materials and prioritizing energy efficiency in the production processes.

Moreover, Seranit makes investments and conducts research studies to reuse its wastewater and usable waste, and to reduce and improve gas emissions aiming for zero waste with in the scope of its environmental protection program.

Seranit proves that they care about the people and the environment with numerous certificates such as TSE ISO EN 14000, TS EN ISO 14001:2004, TS 18001:2008, TSE ISG OHSAS TS 18001 and ISO 9001:2008. The company had also certified its superior quality in ceramic and porcelain tile production with the TS EN 14411 Double Star Certificate in 2014.



Porcelain tiles manufactured by Seranit in Inönü Plant and Bilecek Plant, Turkey and covered under this Environmental Product Declaration are primarily made of naturally occurring major raw materials such as feldspar, clay, and kaolin, but they may also include other minor raw materials such as silica sand and pegmatite. The typical compositions of these products are shown below.

Composition	%
Feldspar	40-50
Clay	30-40
Kaolin	10-20
Silica Sand	5-15
Pegmatite	1-10

(Porcelain Tile Composition)

The required composition is mixed with water to form uniform slurry, which is generally referred as “masse”. This slurry is then fed into spray driers to form uniform granules ready for compaction. These granules are shaped to form the bisque or green body. This can be glazed or left unglazed depending on its intended use. The porcelain tiles, produced with a size of 20x60, 30x60, 30x90, 40x80, 33x100, may be utilized in the following areas:

- Commercial buildings (interior/exterior spaces of shopping centers, hotels, office buildings, banks, restaurants, stores etc.)
- Residences (interior/exterior spaces of luxury houses, villas etc.)
- Public buildings (municipalities, courthouses etc.)
- Educational facilities, culture centers (interior/exterior spaces of schools, theater halls, culture centers etc.)
- Interior/exterior wall applications

UN CPC code for porcelain tiles is 37310.

No substances included in the Candidate List of Substances of Very High Concern for authorisation under the REACH Regulations are present in the porcelain tiles manufactured by Seranit, either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

TECHNICAL CHARACTERISTICS		REQUIRED VALUES	SERANIT DECLARED VALUES Average values of production
Dimensions and surface quality	Uzunluk ve genişlik Length and Width	N≥ 15 cm ± %0.6, ± 2 mm	± 0.5%, ± 0.5 mm
	Kalınlık Thickness	N≥ 15 , ± 5% ,± 0.5%	± 4%, ±0.3 mm
	Gönyeden Sapma Rectangularity	± 0.5% , ± 2 mm	± 0.4%, ± 1.2 mm
	Kenar Düzgünlüğü Straightness of sides	± 0.5% , ± 1.5 mm	± 0.3%, ± 1.0 mm
	Yüzey Düzgünlüğü(Eğrilik ve Peçlik) Surface flatness	± 0.5% , ± 2 mm	Centre curvature:0.3% ± 1.5 mm Edge curvature:0.3 % ,± 1.5 mm Warpage: 0.3 %, ± 1.5 mm
	Yüzey Kalitesi Surface Quality	A minumum of 95% of the tiles shall be free from visible defects that would impair the appearence of a major area of tiles	A minumum of 95% of the tiles shall be free from visible defects that would impair the appearence of a major area of tiles
Water absorption		E≤ 0.5% , max(individual max.) %.0.6	ave.E≤ 0.06 %, (individual max.) %.0.15
Breaking Strength (Newton)	Thickness ≥ 7.5mm	S ≥ 1300 N	S ≥ 2500
Modulus of rupture (N/mm$^{2)}$		R ≥35 N / mm2	R≥ 45
Impact resistance by measurement of coefficient of restitution		Manufacturer to state classification	0.81
Resistance to surface abrasion - intended for use on floors		Reported abrasion class and cycles	ave. Class 3, cycle 750
Determination of linear thermal expansion		Manufacturer to state classification	6.10x 10^{-6} / ºC
Resistance to thermal shock		Required	Resistant
Moisture expansion, in mm/m'e		Manufacturer to state classification	0.1
Crazing resistance		Required	Resistant
Frost resistance		Required	Resistant
Resistance to low concentrations of acids and alkalis		Manufacturer to state classification	LA
Resistance to high concentrations of acids and alkalis		Test method available	HA
Resistance to household chemicals and swimming pool salts		Min. Class B	A
Resistance to stains		Min. 3	5
Lead and cadmium given off by tiles		Manufacturer to state classification (mg/dm^2)	Pb <0.1 Cd<0.01
Small color differences		Glazed: ΔE < 0.75	ΔE < 0.75
Surface hardness Mohs		Test method available	ave. 6
Skid resistance		Test method available	Skid resistance product to product ranges. ort. R9/avr. R9
Color resistance to light		Not any noticable color change	Resistant
Bond strength/adhesion A) Cementitious adhesives B)Dispersion adhesives C) Reaction resin adhesives D)Harç		Declared value	A) ≥ 0.5 N/mm² B) ≥ 1 N/mm² C)≥ 2 N/mm² D)Efficiency not ascertained
Radioactivity			≤ 1.0$^{+0,1}$
Reaction to fire		A1FL or A1	A1FL

Relevant standards applied to Porcelain tiles and values by Seranit

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A1 : Raw Material
This stage includes raw material extraction and pre-treatment processes before production. For porcelain tiles, production starts with raw materials, mainly locally sourced but some transported from other parts of the world.

A2 : Transport
This stage is relevant for delivery of raw materials to the plant and forklift usage within the factory.

A3 : Manufacturing
This stage starts with slurry preparation, spray drying, pressing for green body followed by removal of excess humidity. The green body tiles are then glazed, if required, and fired at around 1170°C. After quality control, the end products are then packaged and dispatched. Electricity and natural gas are the energy sources consumed during the manufacturing.

A4 : Transport to Construction Site
This stage involves transportation of porcelain tiles to the construction site.

A5 : Assembly
This stage includes the assembly of tiles using adhesive mortar and water in the construction site. For 1 m^2 porcelain tile installation; 6 kg mortar and 1.5 L water usage was assumed.

B1 : Use Stage
Use Stage is related to any impacts done during use of the product. Porcelain tiles are inert materials, so during the use stage, they do not cause any emissions. Hence, use phase is not relevant for the assessment.

B2 : Maintenance
This stage is related to any activities to maintain the function of the product in its life time. It includes cleaning with water and detergent. Seranit recommends to use detergent containing stain remover or neutral low-sulphate and rinse with tap water after cleaning. 0.2 mL detergent and 0.1 L water use is assumed to clean the surfaces 1 m^2 porcelain tiles.

B3 : Repair
No repair is necessary for porcelain tiles during their use.

B4 : Replacement
No replacement is necessary for porcelain tiles during their use.

B5 : Refurbishment
No refurbishment is necessary for porcelain tiles during their use.

B6 : Operational Energy Use
No energy is used in operation for porcelain tiles.

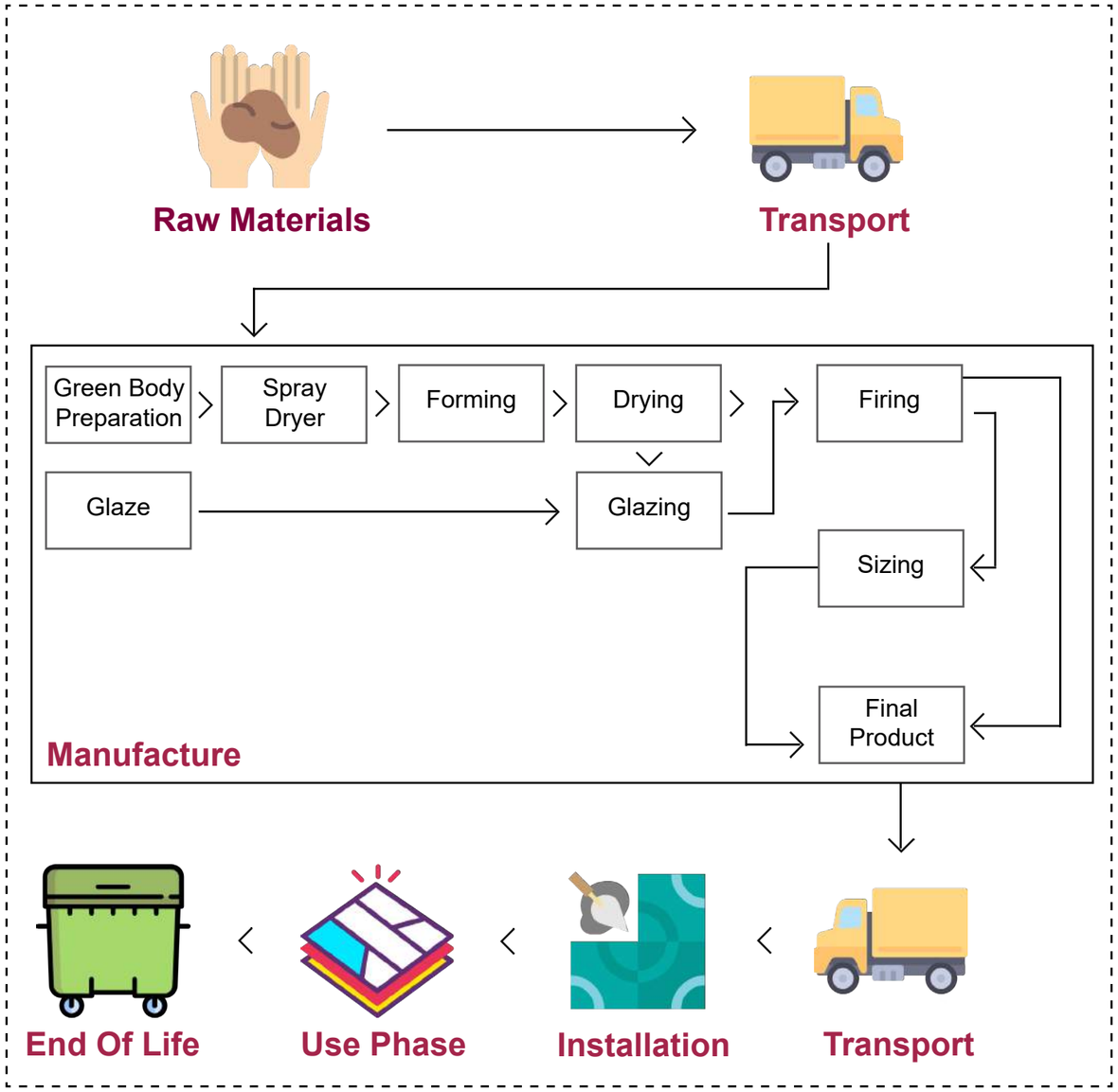
B7 : Operational Water Use
No water is used in operation for porcelain tiles except cleaning as stated in B2.

C1 : De-construction, Demolition at the end of RSL is usually conducted with a selective deconstruction/ demolition. The environmental impacts generated during this phase are very low and therefore can be neglected.

C2 : Transport (Waste) includes the transportation of the discarded tiles and adhesive mortar to final disposal. Average distance from demolition site to inert landfill site for final disposal is assumed to be 50 km.

C3 : Waste Processing involves processing of discarded porcelain tiles for recycling and/or reuse. There is no such processing of porcelain tiles after demolition so this stage can be excluded.

C4 : Disposal is the final stage of product life. Porcelain tiles end up at construction and demolition waste landfills as their final fate and modelled as such or this EPD. The system boundary of the LCA study conducted for Seranit Porcelain Tiles is shown next page.

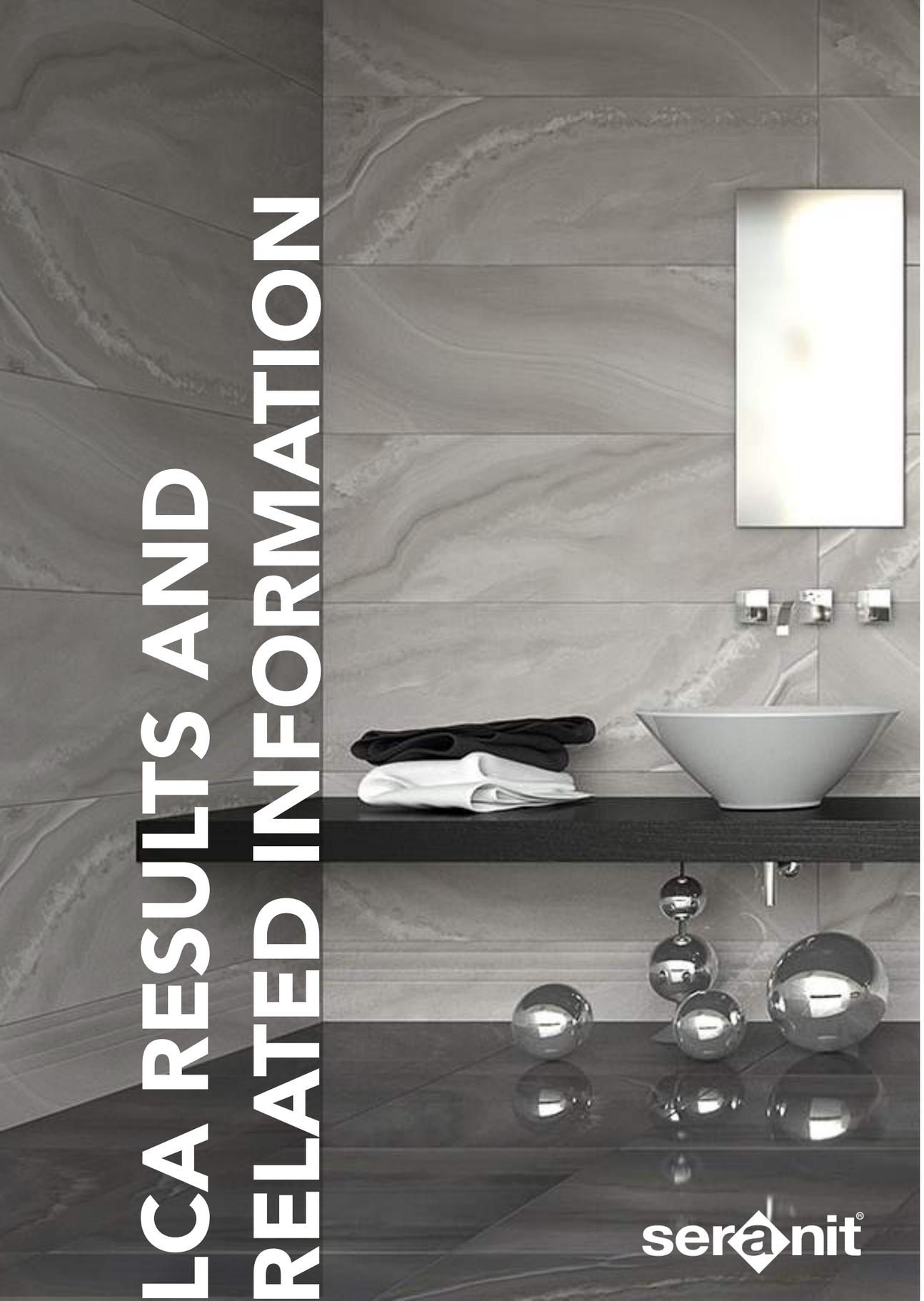


------ System Boundary

(Flow chart of manufacturing porcelain tiles and LCA system boundary)



LCA RESULTS AND RELATED INFORMATION



Functional Unit	1 m^2 porcelain tiles with a weigth of 22.5 kg.
Goal and Scope	Evaluation of environmental impacts of 1 m^2 porcelain tiles from cradle to grave.
System Boundary	The system boundary covers A1 - A3 product stages, A4 - A5 construction, B1 - B7 use and C1 – C4 end of life stages.
Cut-off Rules	1% cut-off is applied.
Background Data	Ecoinvent database (Ver.3.5) (www.ecoinvent.org) TLCID (Turkish Life Cycle Inventory Database, Ver. 1.0) (www.tlcid.org)
Data Quality	Raw materials, energy and water consumption, waste, material and product transport data is primary data collected from Seranit.
Period Under Review	All primary data collected from Seranit refers to the period year of 2019.
Allocations	Seranit has two manufacturing plants for porcelain tiles: İnönü and Bilecek. Environmental impacts are allocated according the production quantities of both plants. There are no co-products in the production of porcelain tiles. Hence, there is no need for co-product allocation. Transport is allocated according to tonnages for raw materials bought by Seranit. Similarly, water consumption and energy consumption are also allocated according to the production figures.

Comparability

A comparison or an evaluation of EPD data is only possible where EN 15804 has been followed, and the same building context and product-specific characteristics of performance are taken into account and the same stages have been included in the system boundary.

PRODUCT STAGE	A1	Raw Materials Supply	X
	A2	Transport	X
	A3	Manufacturing	X
CONSTRUCTION PROCESS STAGE	A4	Transport from the gate to the site	X
	A5	Assembly	X
USE STAGE	B1	Use	NR
	B2	Maintenance	X
	B3	Repair	X
	B4	Replacement	X
	B5	Refurbishment	X
	B6	Operational energy use	NR
	B7	Operational water use	NR
END OF LIFE STAGE	C1	De-construction	X
	C2	Transport	X
	C3	Waste processing	X
	C4	Disposal	X
BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES	D	Reuse-Recycling-Recovery Potential	MND

Description of the system boundary (X = Included in LCA, MND= Module Not Declared, NR=Not Relevant)

The system boundaries in tabular form for all modules are shown in the table above. The results of the LCA with the indicators as per EPD requirement are given in the following tables.

Life Cycle Inventory Analysis indicators describing the use of resources are determined respectively to the following impact categories, calculated using CML-IA Baseline (Ver. 3.05) method: Global Warming Potential (GWP) for time span of 100 years, Ozone Layer Depletion Potential (ODP) with time span of infinity, Formation Potential of Tropospheric Ozone Photochemical Oxidants (POCP) with time span of 5 days, Acidification Potential (AP) with time span of eternity, Eutrophication Potential (EP) with time span of eternity, Photochemical Oxidation (POCP) and Abiotic Depletion Potential for Fossil (ADPF) and Non-fossil (ADPE) resources. All energy calculations were done using Cumulative Energy Demand (LHV) (ver. 1.0) methodology. The freshwater use value for manufacturing life cycle was taken from the manufacturer as the net freshwater consumption occurs during the manufacturing stage only. Water Scarcity (WSI) was calculated using AWARE methodology.

ENVIRONMENTAL IMPACTS, 1 m^2 PORCELAIN TILE																
Parameter		Unit	A1 - A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	TOTAL
Global warming Potential	Fossil	[kg CO_2 eq.]	15.4	2.042	7.81	NR	0.00	0	0	0	NR	NR	0	0.078	0	0.005	25.3
	Biogenic	[kg CO_2 eq.]	0.029	638E-6	0.038	NR	4E-6	0	0	0	NR	NR	0	23.5E-6	0	2.73E-6	0.067
	Land Use & Transformation	[kg CO_2 eq.]	0.050	666E-6	0.006	NR	0.001	0	0	0	NR	NR	0	20.6E-6	0	1.45E-6	0.058
	Total	[kg CO_2 eq.]	15.4	2.043	7.86	NR	0.001	0	0	0	NR	NR	0	0.078	0	0.005	25.4
Ozone Layer Depletion Potential		[kg CFC11 eq.]	1.30E-6	369E-9	692E-9	NR	36.8E-12	0	0	0	NR	NR	0	15.5E-9	0	1.90E-9	2.38E-6
Acidification Potential		[kg SO_2 eq.]	0.050	7.80E-3	42.8E-3	NR	2.79E-6	0	0	0	NR	NR	0	208E-6	0	39.8E-6	0.101
Eutrophication Potential		[kg PO_4^{3-} eq.]	0.022	1.39E-3	15.2E-3	NR	2.90E-6	0	0	0	NR	NR	0	45.4E-6	0	8.48E-6	0.039
Photochemical Oxidation Potential		[kg C_2H_4 eq.]	0.004	526E-6	4.61E-3	NR	578E-9	0	0	0	NR	NR	0	16.0E-6	0	3.19E-6	0.009
Abiotic Depletion Potential		[kg Sb eq.]	16.9E-6	5.75E-6	41.5E-6	NR	1.81E-9	0	0	0	NR	NR	0	151E-9	0	5.95E-9	64.2E-6
Abiotic Depletion Potential (Fossil Resources)		[MJ]	212	30.6	106	NR	0.003	0	0	0	NR	NR	0	1.28	0	160E-3	350

WASTE GENERATIONS, 1 m² PORCELAIN TILE																
Parameter	**Unit**	**A1 - A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**TOTAL**
HWD	[kg]	0.001	0	0	NR	0	0	0	0	NR	NR	0	0	0	0	0.001
NHWD	[kg]	6.35	0	0	NR	0	0	0	0	NR	NR	0	0	0	0	2.79
RWD	[kg]	-	-	-	NR	-	-	-	-	NR	NR	-	-	-	-	-
Legend	HWD: Hazardous Waste Disposed, NHWD: Non-Hazardous Waste Disposed, RWD: Radioactive Waste Disposed, NR: Not Relevant, - : Not Calculated															

RESOURCE USE, 1 m² PORCELAIN TILE																
PERE	[MJ]	259	0.358	6.82	NR	0.006	0	0	0	NR	NR	0	0.013	0	0.001	266.7
PERM	[MJ]	0.000	0	0	NR	0	0	0	0	NR	NR	0	0	0	0	0
PERT	[MJ]	259	0.358	6.82	NR	0.006	0	0	0	NR	NR	0	0.013	0	0.001	266.7
PENRE	[MJ]	219	31.1	113	NR	0.005	0	0	0	NR	NR	0	1.30	0	0.162	365
PENRM	[MJ]	0.000	0	0	NR	0	0	0	0	NR	NR	0	0	0	0	0
PENRT	[MJ]	219	31.1	113	NR	0	0	0	0	NR	NR	0	1.30	0	0.162	365
SM	[kg]	0.480	0	0	NR	0	0	0	0	NR	NR	0	0	0	0	0.480
RSF	[MJ]	0.000	0	0	NR	0	0	0	0	NR	NR	0	0	0	0	0.000
NRSF	[MJ]	0.000	0	0	NR	0	0	0	0	NR	NR	0	0	0	0	0.000
FW	[m³]	0.099	0.005	0.085	NR	205E-6	0	0	0	NR	NR	0	279E-6	0	0.007	0.197
WSI	[m³]	5.30	0.215	4.71	NR	0.007	0	0	0	NR	NR	0	0.010	0	0.007	10.26
Legend	PERE: Use of renewable primary energy excluding 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 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, WSI: Water Scarcty Imdex, NR: Not Relevant															

OUTPUT FLOWS, 1 m² PORCELAIN TILE																
CR	[kg]	-	-	-	NR	-	-	-	-	NR	NR	-	-	-	-	-
MR	[kg]	-	-	-	NR	-	-	-	-	NR	NR	-	-	-	-	-
MER	[kg]	-	-	-	NR	-	-	-	-	NR	NR	-	-	-	-	-
EEE	[MJ]	-	-	-	NR	-	-	-	-	NR	NR	-	-	-	-	-
EET	[MJ]	-	-	-	NR	-	-	-	-	NR	NR	-	-	-	-	-
Legend	CR: Components for Reuse, MR: Materials for Recycling, MER: Materials for Energy Recover, EEE: Exported Energy (Electricity), EET: Exported Energy (Thermal), - : Not Calculated, NR: Not Relevant															

References

General Programme Instructions of the International EPD® System. Version 3.0.

/OHSAS 18001/ Occupational health and safety management systems - Specification

/EN 14411/ Ceramic tiles - Definitions, classification, characteristics and marking

/ISO 9001:2008/ Quality Management Systems-Requirements

/TSE EN 14411/ Double Star Criteria - Ceramic tiles - Definitions, classification, characteristics and marking

/EN 15804/ EN 15804:2012+A1:2013, Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products

/EN ISO 10545-2/ Technical Standard for Ceramic Tiles - Part 2: Determination of dimensions and surface quality

/EN ISO 10545-3/ Technical Standard for Ceramic Tiles - Part 3. Determination of water absorption apparent porosity, apparent relative density and bulk density

/EN ISO 10545-4/ Technical Standard for Ceramic Tiles - Part 4: Determination of modulus of rup-ture and breaking strength

/EN ISO 10545-5/ Technical Standard for Ceramic Tiles - Part 5: Determination of impact resistance by measurement of coefficient of restitution

/EN ISO 10545-7/ Technical Standard for Ceramic Tiles - Part 7: Determination of resistance to sur-face abrasion for glazed tiles

/EN ISO 10545-8/ Technical Standard for Ceramic Tiles - Part 8: Determination of linear thermal expansion

/EN ISO 10545-9/ Technical Standard for Ceramic Tiles - Part 9: Determination of resistance to thermal shock

/EN ISO 10545-10/ Technical Standard for Ceramic Tiles - Part 10: Determination of moisture expan-sion

/EN ISO 10545-11/ Technical Standard for Ceramic Tiles - Part 11: Determination of crazing re-sistance for glazed tiles

/EN ISO 10545-12/ Technical Standard for Ceramic Tiles - Part 12: Determination of frost resistance

/EN ISO 10545-13/ Technical Standard for Ceramic Tiles - Part 13: Determination of chemical re-sistance

/EN ISO 10545-14/ Technical Standard for Ceramic Tiles - Part 14: Determination of resistance to stains

/EN ISO 10545-15/ Technical Standard for Ceramic Tiles - Part 15: Determination of lead and cadmi-um given off by glazed tiles

/EN 101/ Ceramic Tiles - Determination of Scratch Hardness of Surface According to Mohs

/DIN 51130/ Testing of floor coverings - Determination of the anti-slip property - Workrooms and fields of activities with slip danger - Walking method - Ramp test

/DIN 51094/ Ceramic tiles - Testing of the light fastness and colour fastness of ceramic tiles for walls and floors

/ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environ-mental declarations — Principles and procedures

/ISO 14040-44/ DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006) and Requirements and guidelines (ISO 14044:2006)

EN 15804/ EN 15804:2012+A1:2013, Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products

/PCR for Construction Products and CPC 54 Construction Services/ Prepared by IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2012:01 Version 2.3, Date 2018-11-15

/ Sub PCR for Ceramic Tiles/ Prepared by IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, Sub PCR to PCR 2012:01 Version 2.3, Date: 2019-04-29

/Ecoinvent / Ecoinvent Centre, www.Eco-invent.org

/SimaPro/ SimaPro LCA Package, Pré Consultants, the Netherlands, www.pre-sustainability.com

Verification & Registration

Programme	EPD registered through fully aligned regional programme: EPD Turkey www.epdturkey.org TURKEY EPD® ENVIRONMENTAL PRODUCT DECLARATIONS	The International EPD® System www.environdec.com EPD® THE INTERNATIONAL EPD® SYSTEM
Programme Operator	EPD Turkey: SÜRATAM – Turkish Centre for Sustainable Production Research & Design Nef 09 B Blok No:7/15, 34415 Kağıthane / Istanbul, TURKEY info@suratam.org www.suratam.org	EPD International AB Box 210 60 SE-100 31 Stockholm, Sweden info@environdec.com
Owner of the Declaration	seranit Büyükdere Caddesi,Akabe Ticaret Merkezi No: 1 Likör Yanı Sokak, Kat: 4,Daire; 401-402 Mecidiyeköy / Istanbul / TURKEY	Contact: Ayşe Gülhan Koyuncu Phone: (+90) 222 211 07 77 Fax: (+90) 228 314 04 29 www.seranit.com.tr info@seranit.com.tr
LCA practitioner and EPD Design	metsims Sustainability Consulting Turkey: Lalegül Sok. No:7/18 Kağıthane 34415 Istanbul, Turkey (+90) 212 281 13 33 infotr@metsims.com	United Kingdom: 4 Clear Water Place Oxford OX2 7NL (+44) 800 772 0185 info@metsims.com www.metsims.com
Indipendent Verifier	LCA studio	Vladimír Kočí, PhD LCA Studio Šárecká 5,16000 Prague 6 - Czech Republic www.lcastudio.cz

