Type III Environmental Product Declaration No. 560/2023

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Ceramic tiles

Owner of the EPD:

Tubądzin Management Group Sp. z o.o.
Address: Cedrowice Parcela 11
95-035 Ozorków, Poland
Tel.: 42 710 37 00
Website: https://www.tubadzin.pl/
Contact: sekretariatct3@tubadzin.pl

EPD Program Operator:

Instytut Techniki Budowlanej (ITB)
Address: Filtrowa 1,
00-611 Warsaw, Poland
Website: www.itb.pl
Contact: Michał Piasecki
m.piasecki@itb.pl
energia@itb.pl

ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A3, A4-A5 and D modules in accordance with EN 15804
(Cradle-to-Gate with options)

The year of preparing the EPD: 2023

Product standards: EN 14411, EN 10545, EN 13501-1:2007+A1:2009

Service Life: 50 years

PCR: ITB-PCR A

Declared unit: 1 m^2 of ceramic tile product

Reasons for performing LCA: B2B

Representativeness: Poland, 2022

MANUFACTURER

GRUPA TUBĄDZIN has been setting design trends for 40 years, and the company's products are characterized by global quality, thanks to the use of the most advanced technologies. The manufacturing plant of Ceramika Tubądzin III sp. z o.o. s.k. is located in Sieradz (Poland). In 2016, the company launched the most modern production plant in this part of Europe, becoming a Polish pioneer in the production of large-format tiles, reaching up to 120 x 275 cm in size. Tubądzin brand tiles are made from natural and noble raw materials, and dyes that are safe for health and nature are used to decorate them. They can be used in any space, not only in bathrooms - they are perfect as an original and durable cladding for furniture, as well as for facades. The rich assortment of the Tubądzin Group consists of recognizable brands, each of which introduces its own collections and product lines. Trading partners are an extremely important element of the Tubądzin Group's operations. The distribution network is based on a group of large ceramic tile wholesalers, which serve smaller retail outlets in their area of operation. The combination of distributors' involvement in the promotion of products allows the company to steadily increase sales. Currently, the Tubądzin Group sells its products in 70 countries. Sales countries - 70, showrooms in the country - 1500, showrooms abroad - 2000, annual production in m^2 - 15 million, export sales - 35%.

Figure 1 The view of Ceramika Tubądzin III sp. z o.o. s.k. manufacturing plant located in Sieradz.

PRODUCTS DESCRIPTION

EPD covers ceramic tiles dry pressed (group Bia) for various types of use. Ceramic tiles are manufactured using the following materials: clay, dolomite, kaolin, grit, feldspar, sand, colorants and other additives. The functional properties of the ceramic tiles are presented in Table 1, According to EN 13501-1:2007+A1:2009 ceramic tiles can be classified as Class A1 fire resistance classification, as they do not contribute to fire. Ceramic tiles cannot react with water because they are an insoluble material. Following in Table 1 are the basic parameters of the tiles.

Table 1 Physical and chemical properties of ceramic tiles

Specifications	Standard	Standard requirements	Value obtained
Water absorption (% by weight)	EN ISO 10545-3	$E_b \leq 0,5$	$E_b < 0,5$
Breaking force ≥ 7.5 mm [N]	EN ISO 10545-4	not less than 1300	not less than 1500
Breaking force < 7.5 mm [N]	EN ISO 10545-4	not less than 700	not less than 1200
Bending strength [N/mm^2]	EN ISO 10545-4	min. 35	min. 45
Surface abrasion resistance of glazed tiles	EN ISO 10545-7	abrasion class	III-V
Resistance to indentation abrasion	EN ISO 10545-6	Max. 175	<135
Resistance to thermal shock	EN ISO 10545-9	required	resistant
Resistance to hairline cracks glazed tiles	EN ISO 10545-11	required	resistant
Frostproof	EN ISO 10545-12	required	resistant
Resistance to spotting	EN ISO 10545-14	min. class 3	class 4-5
Chemical resistance to household chemicals	EN ISO 10545-13	min. B	GB
Low-concentration acids and bases	EN ISO 10545-13	declared value	min. class GLB/ULB
High-concentration acids and bases	EN ISO 10545-13	declared value	min. class GHB/UHB
Slippage	CEN/TS 16165	declared value	according to the product technical sheet

All additional technical information about the product is available on the manufacturer's website and catalogues.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 m^2 of product of statistically representative product (weight 19.1 kg/m^2).
In the case of a different mass of specific 1 m^2, a conversion factor shall be used. Environmental impacts (as provided later in EPD) values divided into 19.1 x the weight of 1 m^2 of a specific product.

System boundary

The life cycle analysis of the declared products covers “Product Stage” A1-A3, A4, C2-C4+D modules in accordance with EN 15804 and ITB PCR A (cradle to gate with options). Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculation. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Allocation

The allocation rules used for this EPD are based on ITB PCR A and EN 15804+A2. Production of the ceramic tiles is a line process conducted in Ceramika Tubądzin III sp. z o.o. s.k. Allocation was done on product mass basis. All impacts associated with the extraction and processing of raw materials used for the production of ceramic tiles are allocated in module A1 of the LCA . Impacts from the global line production were inventoried and 100% were allocated to the ceramic tiles production. Water and energy consumption, associated emissions and generated wastes are allocated to module A3 Packaging materials were takien into consideration.

System limits

Type of the EPD is: cradle to gate - with options. The following life cycle stages were considered. Production stage including: A1 - Raw material extraction and processing, A2 - Transport to the manufacturer and A3 - Manufacturing, A4 - Transport to Site, A5 - Installation, End-of-life stage: C1 - Deconstruction, C2 - Transport to waste processing, C3 - Waste processing, C4 - Disposal (landfill). This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues. EPD includes D module- declaration of all benefits and loads beyond product system. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA. 99.8% materials submitted for the formulations and production data were taken into consideration. In the assessment, all available data from production have been considered, i.e. all raw materials/elements used as per formulation process, utilized thermal energy for heating, and electric power consumption. It can be assumed that the total sum of neglected processes does not exceed 0.5 % of energy use and mass per modules.

Modules A1 and A2: *Raw materials supply and transport*

The modules A1 and A2 represent the extraction and processing of raw materials and components and transport to the production sites. Clays, sand, additives and packaging materials are sourced from domestic and foreign suppliers (train, ship and TIR). Means of transport include trucks (inventoried). Polish and European standards for average combustion were used for calculations. Data on mode of transport and distances, as reported by suppliers were used for those materials and parts contributing more than 0.1 % of total product mass.

Module A3: *Production*

The production of ceramic tiles is carried out in Ceramika Tubądzin III sp. z o.o. s.k. in Sieradz (Poland). Main ingredients are used for the production of ceramics like as: pure clay, feldspar, kaolin.

A scheme of the ceramic tiles production process by Ceramika Tubądzin III sp. z o.o. s.k. is presented in Fig. 2. Gas and electricity is consumed in production process.

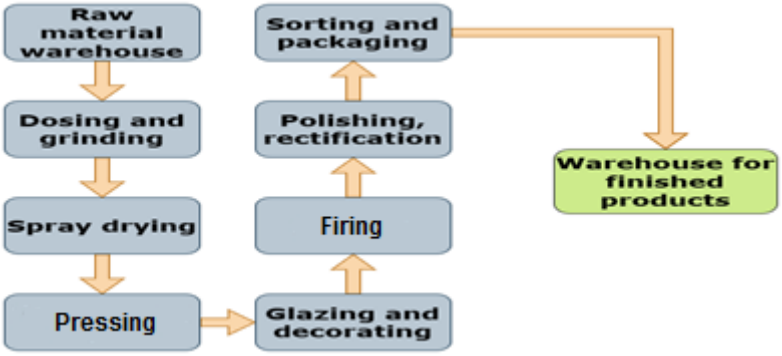

Figure 2 Manufacturing process scheme (A3)

Module A4: *Transport to a construction site*

The ceramic tiles produced are delivered to Polish as well as foreign customers. In the adapted scenario an average distance of 250 km from the factory gate to a recipient is assumed. Means of transport include 16-32t lorry (EURO 5) with fuel consumption of 35 l per 100 km.

Module A5: *Installation process*

In the adapted scenario the installation process requires adhesive mortar, water and other ancillary materials recommended by Ceramika Tubądzin. Only consumable materials have been included in the calculation. Tiles are attached to wall and floor surfaces using specific materials and in various quantities (for example: dispersion adhesives, cement adhesives and mortars, sealants or applied liquid membranes). Installation of stoneware tiles does not cause health or environmental hazards, and no emissions are produced during installation.

Modules *C and D: End-of-life (EOL)*

In the adapted scenario, dismantling of ceramic tiles (C1) is performed as part of building renovation or demolition processes, where environmental impacts from declared products can be considered as minor (<1%). There are no specific deconstruction methods, applied in Poland, in regards with the ceramic tiles so the electric tools impact was assumed. During the demolition process the major amount of the products contribute to the construction and demolition wastes which can be processed on site or in a waste processing plant. It is assumed that 100% of ceramic tiles are recovered at the EoL cycle. Recovered material is transported to either to landfill or construction site distant by 100 km, on 16-32t lorry (EURO 5) with fuel consumption of 35 l per 100 km. In the adapted scenario 50% of the ceramic tiles is recycled and further used as aggregate for road foundation or ballast (credits presented in module D) while remaining 50% is forwarded to landfill in the form of mixed construction and demolition wastes. Environmental burdens declared in module C4 are associated with waste-specific emissions to air, soil and groundwater. Regarding the recycling material of metals, the metal parts in the EoL are declared as end-of-waste status. Electricity at end-of-life (module C) has been modelled. Electricity at end-of-life (module D) has been modelled using an average EU-27 electricity mix as the location where the product reaches end-of-life is unknown.

Table 2 End-of-life scenario for the ceramic tiles

Material	Material recovery	Recycling	Landfilling
ceramic	100%	50%	50%

Electricity at end-of-life (module C) has been modelled using an average Polish electricity mix as the location where the product reaches end-of-life is unknown.

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2022 – 31.12.2022 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Data quality

The data selected for LCA originate from ITB-LCI questionnaires completed by Ceramika Tubądzin III sp. z o.o. s.k. and verified during data audit. No data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency is judged as good. The background data for the processes come from the following resources database Ecoinvent v.3.9.1 (clay, feldspar, kaolin, pigments, paper, carton, other, EUR-flat pallet, structural timber). Specific (LCI) data quality analysis was a part of the input data verification.

Assumptions and estimates

The impacts of the representative products were aggregated using weighted average.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN15804+A2. Emission of greenhouse gases was calculated using the IPCC 2013 GWP method with a 100-year horizon. Emission of acidifying substances, Emission of substances to water contributing to oxygen depletion, Emission of gases that contribute to the creation of ground-level ozone, Abiotic depletion, and ozone depletion emissions where all calculated with the CML-IA baseline method.

Additional information

Polish electricity (Ecoinvent v.3.9.1 supplemented by actual national KOBiZE data) emission factor used is 0.702 kg CO_2/kWh. As a general rule, no particular environmental or health protection measures other than those specified by law are necessary. Ceramics are inherently inert, chemically stable, and therefore do not emit pollutants and substances hazardous to the environment and health during use, such as VOCs and radon.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 m^2 of ceramic tiles produced in Poland. The following life cycle modules (Table 3) were included in the analysis. The following tables 4-7 show the environmental impacts of the life cycle of selected modules (A1-A5+C1-C4+D).

Table 3 System boundaries for the environmental characteristic of the product.

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)															
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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
MD	MD	MD	MD	MD	MND	MND	MND	MND	MND	MND	MND	MD	MD	MD	MD	MD

Table 4 Life cycle assessment (LCA) results for ceramic tiles – environmental impacts of (DU: 1 m^2)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO_2	3.15E+00	2.29E+00	5.16E+00	1.06E+01	1.59E+00	8.89E-04	1.33E-01	1.59E-01	8.88E-01	1.02E-01	-2.40E-01
Greenhouse potential - fossil	eq. kg CO_2	4.15E+00	2.28E+00	5.16E+00	1.16E+01	1.59E+00	8.72E-04	1.31E-01	1.59E-01	8.84E-01	1.00E-01	-2.39E-01
Greenhouse potential - biogenic	eq. kg CO_2	-1.02E+00	6.90E-03	3.96E-03	-1.01E+00	5.43E-03	2.55E-05	3.82E-03	5.43E-04	7.77E-03	1.01E-03	-1.61E-03
Global warming potential - land use and land use change	eq. kg CO_2	1.58E-02	9.97E-04	1.14E-03	1.79E-02	6.23E-04	3.06E-07	4.58E-05	6.23E-05	1.90E-04	1.02E-04	-9.97E-05
Stratospheric ozone depletion potential	eq. kg CFC 11	3.09E-07	5.19E-07	2.84E-07	1.11E-06	3.67E-07	1.78E-11	2.67E-09	3.67E-08	7.60E+00	3.06E-08	-8.30E-09
Soil and water acidification potential	eq. mol H+	2.60E-02	9.47E+01	7.24E-03	9.47E+01	6.44E-03	9.68E-06	1.45E-03	6.44E-04	8.08E-03	8.48E-04	-7.40E-04
Eutrophication potential - freshwater	eq. kg P	2.56E-03	1.43E-04	3.91E-04	3.10E-03	1.07E-04	1.66E-06	2.48E-04	1.07E-05	5.00E-04	2.92E-05	-2.88E-05
Eutrophication potential - seawater	eq. kg N	5.10E-03	4.81E-03	1.18E-03	1.11E-02	1.94E-03	1.40E-06	2.10E-04	1.94E-04	1.80E-02	2.93E-04	-2.61E-04
Eutrophication potential - terrestrial	eq. mol N	4.83E-02	5.28E-02	1.24E-02	1.13E-01	2.12E-02	1.18E-05	1.78E-03	2.12E-03	3.69E-02	3.18E-03	-2.90E-03
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.62E-02	1.48E-02	4.82E-03	3.57E-02	6.50E-03	3.31E-06	4.97E-04	6.50E-04	8.25E-03	9.21E-04	-1.03E-03
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.38E-04	7.46E-06	3.67E-05	2.82E-04	5.63E-06	4.25E-09	6.38E-07	5.63E-07	1.42E-06	3.40E-07	-6.00E-07
Abiotic depletion potential - fossil fuels	MJ	7.61E+01	3.32E+01	4.11E+01	1.50E+02	2.36E+01	1.48E-02	2.22E+00	2.36E+00	5.02E+00	2.32E+00	-3.84E+00
Water deprivation potential	eq. m^3	2.53E+00	1.47E-01	6.64E-01	3.34E+00	1.09E-01	3.06E-04	4.58E-02	1.09E-02	1.05E-01	1.35E-02	-4.11E-02

Table 5 Life cycle assessment (LCA) results for ceramic tiles – additional impacts indicators (DU: 1 m^2)

Indicator	Unit	A1-A3	A4-A5	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA

Table 6 Life cycle assessment (LCA) results for ceramic tiles - the resource use (DU: 1 m^2)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	8.45E+00	4.49E-01	2.33E+01	3.22E+01	3.38E-01	1.10E-03	1.64E-01	3.38E-02	3.44E-01	4.08E-02	-2.40E-01
Consumption of renewable primary energy resources used as raw materials	MJ	5.72E+00	0.00E+00	0.00E+00	5.72E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	1.42E+01	4.49E-01	2.34E+01	3.80E+01	3.38E-01	1.10E-03	1.64E-01	3.38E-02	3.40E-01	4.08E-02	-2.40E-01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	7.18E+01	3.32E+01	7.34E+00	1.12E+02	2.36E+01	1.48E-02	2.22E+00	2.36E+00	5.04E+00	2.51E+00	-3.84E+00
Consumption of non-renewable primary energy resources used as raw materials	MJ	4.38E+00	0.00E+00	0.00E+00	4.38E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	7.61E+01	3.32E+01	4.47E+01	1.54E+02	2.36E+01	1.48E-02	2.22E+00	2.36E+00	5.04E+00	2.51E+00	-3.84E+00
Consumption of secondary materials	kg	1.06E-01	1.16E-02	8.83E-03	1.26E-01	7.90E-03	1.35E-06	2.02E-04	7.90E-04	6.72E-04	0.00E+00	9.74E+00
Consumption of renew. secondary fuels	MJ	1.59E-02	1.14E-04	3.89E-04	1.64E-02	8.70E-05	7.52E-09	1.13E-06	8.70E-06	5.88E-06	0.00E+00	-1.04E-05
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-05	1.79E-03	0.00E+00	3.59E-03	0.00E+00	0.00E+00
Net consumption of freshwater	m^3	8.37E-02	3.95E-03	2.35E-02	1.11E-01	2.96E-03	4.01E-06	6.02E-04	2.96E-04	1.72E-03	3.62E-04	-1.62E-02

Table 7 Life cycle assessment (LCA) results for ceramic tiles – waste categories (DU: 1 m^2)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	kg	2.37E-01	3.82E-02	3.68E-02	3.12E-01	2.64E-02	1.53E-07	2.29E-05	2.64E-03	6.23E-05	3.66E-06	2.95E-03
Non-hazardous waste	kg	3.79E+01	6.29E-01	4.21E+00	4.27E+01	4.69E-01	7.95E-06	1.19E-03	4.69E-02	9.57E+00	9.57E+00	1.29E-01
Radioactive waste	kg	4.12E-03	2.29E-06	2.17E-05	4.14E-03	1.76E-06	1.11E-08	1.66E-06	1.76E-07	1.45E-05	1.41E-05	2.95E-03
Components for re-use	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
Materials for recycling	kg	2.40E-03	5.11E-04	8.04E-02	8.33E-02	7.30E-05	1.53E-08	2.29E-06	7.30E-06	1.10E-07	0.00E+00	4.48E-05
Materials for energy recovery	kg	3.19E-05	8.34E-07	1.34E-04	1.67E-04	5.90E-07	1.34E-10	2.01E-08	5.90E-08	1.31E-09	0.00E+00	1.26E-07
Exported Energy	MJ	3.84E-01	4.73E-03	7.72E-03	3.96E-01	0.00E+00	4.41E-05	6.61E-03	0.00E+00	0.00E+00	0.00E+00	3.57E-03

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 and ITB PCR A
Independent verification corresponding to ISO 14025 (sub clause 8.1.3.) [x] external [ ] internal
External verification of EPD: Halina Prejzner, PhD. Eng. LCI audit and verification: Michał Chwedaczuk, M.Sc. Eng. LCA, LCI audit and input data verification: Michał Piasecki, PhD., D.Sc., eng.

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the for the information provided and contained in EPD. Declarations of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Note 2: Note: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A, V1.6 General Product Category Rules for Construction Products (2023)
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- EN 14411:2012 Płytki ceramiczne -- Definicje, klasyfikacja, właściwości, ocena zgodności i znakowanie
- KOBiZE Wskaźniki emisyjności CO_2, SO_2, NO_x, CO i pyłu całkowitego dla energii elektrycznej, grudzień 2021
- Ecoinvent.org

Instytut Techniki Budowlanej

Signature Not Verified
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Instytut Techniki Budowlanej
00-611 Warsaw, Filtrowa 1

Thermal Physics, Acoustics and Environment Department
02-656 Warsaw, Ksawerów 21

CERTIFICATE № 560/2023
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Ceramic tiles

Manufacturer:

Tubądzin Management Group Sp. z o.o.
ul. Cedrowice Parcela 11, 95-035 Ozorków, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued on 24th November 2023 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics
and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director
for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, November 2023