ENVIRONMENTAL PRODUCT DECLARATION

acc. to ISO 14025 and EN 15804

Owner of the Declaration	NBK Keramik GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-NBK-20160120-CBE1-DE
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Valid until	20.09.2021

TERRART® ceramic façade panels

NBK Keramik GmbH

Institut Bauen und Umwelt e.V.

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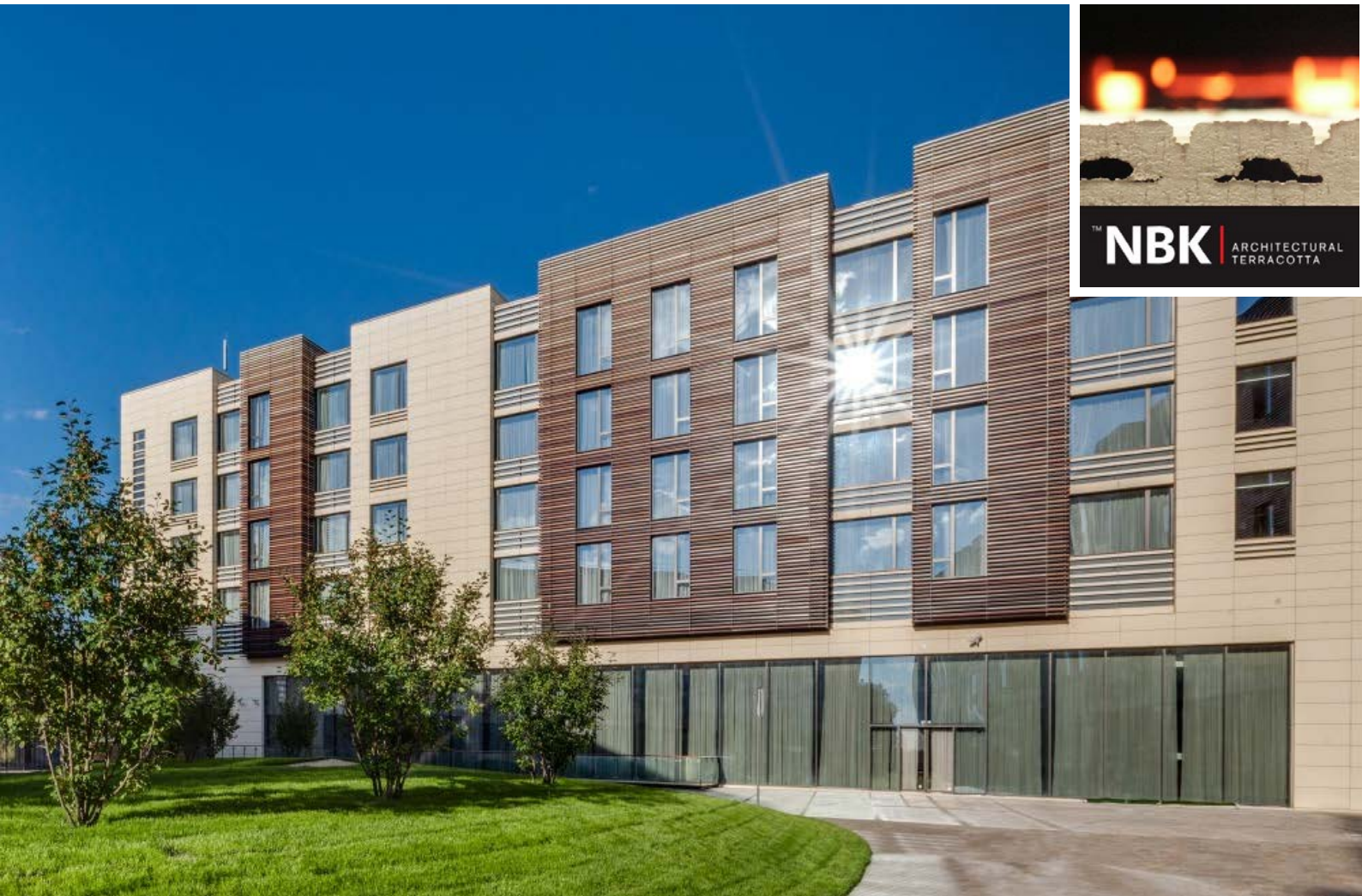

General Information

NBK Keramik GmbH	**TERRART®**
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** NBK Keramik GmbH Reeser Straße 235 46446 Emmerich am Rhein
Declaration number EPD-NBK-20160120-CBE1-DE	**Declared product / declared unit** 1 m² of ceramic façade panel
This declaration is based on the Product Category Rules: Ceramic panelling, 07.2014 (PCR tested and approved by the Independent Advisory Board, SVR)	**Scope:** This EPD applies to 1 m² of **TERRART®** ceramic façade panel produced by NBK Keramik GmbH in Emmerich am Rhein. The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.
Issue date 21.09.2016	
Valid until 20.09.2021	**Verification** The CEN standard /EN 15804/ serves as the core PCR. Verification of the EPD by an independent third party acc. to /ISO 14025/ ☐ internally ☒ externally
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	
Dr. Burkhart Lehmann (Managing Director IBU)	Dipl. Geog. Stefan Seum, Independent verifier appointed by SVR

Product

Product description
The TERRART® range comprises ceramic façade panels made from fired clay. The panels are manufactured using different clay mixtures (white/red clay and fireclay) and obtain their surface characteristics and colours using specific firing cycles. They are available both as dual-case (with hollow chambers) and single-case panels for curtain-type, rear-ventilated façades. The façade panels are connected to the façade's primary support systems using system-oriented aluminium sub-constructions. The sub-construction used in this EPD is a typical sub-construction for use as façade panels.

Application
TERRART® panels are used as cladding material in curtain-type, rear-ventilated façades and for decorative interiors. Façade panels are also used for suspended ceilings, jambs and access covers.

Technical data
TERRART® ceramic façade panels have the following technical characteristics:

Constructional data

Designation	Value	Unit
Gross density	2050 - 2200	kg/m³
Thermal conductivity	1.04 - 1.18	W/(mK)
Water absorption	3 - 10	%
Break load	> 18	N/mm²

Raw materials / additives

TERRART® ceramic façade panels contain the following raw materials and additives:

Clay	55 - 60 % by mass
Fireclay	30 - 35 % by mass
Colour pigments	<1 % by mass
Organic/inorganic additives	2 - 3 % by mass
Glaze / engobe	<1 % by mass

Clays are the weathering products of feldspathic volcanic igneous rocks. Clay is obtained through open-cast mining and refined according to its composition. The clays used here have a sulphur content of < 0.2% and a carbon content of 0.5%. Clay quarrying takes place under compliance with legal requirements and approvals. Recultivation and restoration of open-cast mining areas after completion are ensured. The former value of the areas in question is restored to at least the same value. Recultivation and renaturation take into consideration the protection of nature. This generally

results in higher quality habitats than was the case before mining work was performed.
Fireclay is primarily reclaimed material (broken fragments) from fired and ground ceramics, which is sieved. Comprehensive measures to contain noise and dust emissions are implemented in the grinding process.
Water: Tempering water is taken from the company's own well. Waste water is purified and recycled as processing water.
Colour pigments are used in compounds and glazes. The raw materials are metal oxides that are mixed with engobes or glazes and fired at around 1,050–1,150 °C. This results in inter-crystalline glass-type products which, as almost inert materials, do not contribute to environmental or toxicological problems. Integration in the crystal lattice causes the metal oxides to lose all of their original chemical, physiological and physical properties.
Engobe: is a porous to dense clay-based fired surface coat.
Glaze: is a glass-based fired surface coat.

Aluminium sub-construction: The façade panels are connected to the façade's primary support systems using system-oriented aluminium sub-constructions.

Reference service life
The average service life of TERRART® ceramic façade panels is equal to the building service life and is at least 50 years /BNB/.

LCA: Calculation rules

Declared unit
The declaration refers to the production of 1 m² of average ceramic façade panel for the representative product TERRART® including system-oriented sub-construction with aluminium profiles.

Declared unit

Designation	Value	Unit
Declared unit	1	m^2
Grammage (65 kg panel, 2,07 kg sub-construction)	67.07	kg/m^2
Gross density (average)	2125	kg/m^3
Conversion factor to 1 kg	0.015	-

System limit
The system limit of the "cradle to gate, with options" EPD follows the modular structure of /EN 15804/. The ecobalance of the product in question includes the following lifecycle phases and modules:

A1-A3 (production stage): Raw material provision, transportation to the manufacturer, manufacture (including energy generation, provision of additives, packaging materials and waste disposal).

C4 (removal at disposal stage):
The disposal scenario covers the dumping of the panels at a landfill site for building debris. The disposal outlay for sub-construction parts that are not recycled is still included in this module.

D (credit items and loads outside the system limit):
Credit items arise from the recycling of the aluminium sub-construction.

Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.

LCA: Scenarios and additional technical information

The following technical information is the basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment.

End of life stage (C1-C4)

Designation	Value	Unit
Collected separately	67.07	kg
Collected as mixed construction waste	0	kg
Reuse	0	kg
Recycling	2.07	kg
Energy recovery	0	kg
Landfilling	65	kg

Reuse, recovery and recycling potential (D), relevant scenario information

Designation	Value	Unit
Aluminium for material recycling	1.6	kg
Steel for material recycling	0.2	kg
Inert waste for landfill	65	kg
Plastic waste for incineration (cannot be used for recycling)	0.2	kg

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

Production stage			Phase of the erection of the building		Use stage							Disposal stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the manufacturer to the place of use	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction / demolition	Transport	Waste processing	Disposal	Reuse, recovery or recycling potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² TERRART façade panel including sub-construction (67.07 kg/m²)

Parameter	Unit	A1-A3	C3	C4	D
Global warming potential	[kg CO_2-Eq.]	90.51	0.00	1.52	-16.07
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	8.69E-9	0.00E+0	1.70E-11	4.74E-9
Acidification potential of land and water	[kg SO_2-Eq.]	2.03E-1	0.00E+0	6.39E-3	-7.05E-2
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	1.74E-2	0.00E+0	8.79E-4	-4.69E-3
Formation potential of tropospheric ozone	[kg ethene-Eq.]	1.50E-2	0.00E+0	6.00E-4	-4.43E-3
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	2.76E-4	0.00E+0	3.92E-7	-6.08E-5
Abiotic depletion potential for fossil resources	[MJ]	1266.10	0.00	13.73	-170.74

RESULTS OF THE LCA - RESOURCE USE: 1 m² TERRART façade panel including sub-construction (67.07 kg/m²)

Parameter	Unit	A1-A3	C3	C4	D
Renewable primary energy as energy carrier	[MJ]	125.55	0.00	0.00	0.00
Renewable primary energy resources as material utilization	[MJ]	2.32	0.00	0.00	0.00
Total use of renewable primary energy resources	[MJ]	127.87	0.00	1.41	-62.90
Non-renewable primary energy as energy carrier	[MJ]	1360.44	0.00	0.00	0.00
Non-renewable primary energy as material utilization	[MJ]	1.46	0.00	0.00	0.00
Total use of non-renewable primary energy resources	[MJ]	1361.90	0.00	14.31	-215.05
Use of secondary material	[kg]	19.30	0.00	0.00	0.00
Use of renewable secondary fuels	[MJ]	0.00	0.00	0.00	0.00
Use of non-renewable secondary fuels	[MJ]	0.00	0.00	0.00	0.00
Use of net fresh water	[m³]	2.20E-1	0.00E+0	3.71E-3	-1.38E-1

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² TERRART façade panel including sub-construction (67.07 kg/m²)

Parameter	Unit	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	3.32E-4	0.00E+0	4.45E-6	-5.98E-5
Non-hazardous waste disposed	[kg]	6.15	0.00	65.12	-3.41
Radioactive waste disposed	[kg]	3.80E-2	0.00E+0	2.29E-4	-1.75E-2
Components for re-use	[kg]	0.00	0.00	0.00	0.00
Materials for recycling	[kg]	0.00	2.07	0.00	0.00
Materials for energy recovery	[kg]	0.00	0.00	0.00	0.00
Exported electrical energy	[MJ]	0.00	0.00	0.00	0.00
Exported thermal energy	[MJ]	0.00	0.00	0.00	0.00

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thinkstep
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