Type III Environmental Product Declaration No. 631/2024

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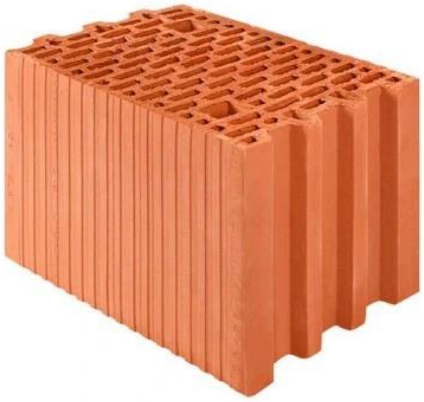
Ceramic blocks



Owner of the EPD:

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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, C1-C4 and D modules in accordance with EN 15804+A2 (Cradle-to-Gate with options)

The year of preparing the EPD: 2024

Product standard: PN EN 771-1+A1:2015-10

Service Life: 100 years for standard product

PCR: ITB-PCR A (PCR 1.6 based on EN 15804+A2)

Declared unit: 1 ton

Reasons for performing LCA: B2B

Representativeness: Polish, European, 2023

MANUFACTURER

CERPOL Sp. z o. o. is a Polish company belonging to the Lode Group, specializing in the production and sale of ceramic building materials. CERPOL Sp. z o. o. is a multi-plant enterprise established as a result of the legal merger of CERPOL and CERABUD. The plant in Kozłowice, built in 1969-72, is successively modernized. It has 2 parallel production lines and 2 tunnel furnaces with a length of 110 m each. Production capacity is approx. 200 thousand. tons of ceramic products per year. The plant has its own raw material base guaranteeing production for several dozen years. The products produced are wall ceramic materials (Table 1).

Fig. 1. The view of CERPOL production line in Kozłowice

PRODUCTS DESCRIPTION AND APPLICATION

The produced clay blocks are intended for the construction of external and internal load-bearing walls and partitions. PRO-MAX is a bricklaying system using ground bricks and Cerpol PRO-MAX polyurethane masonry mortar for thin joints. This combination allows you to build walls several times faster than with traditional technology, while maintaining the highest quality and durability. It also offers a number of additional benefits, both for the investor and the contractor. All hollow bricks offered by Cerpol are made of quality clay. Polished blocks differ from traditional ones by additional grinding of the laying surface and are therefore characterized by exceptional precision of laying, unparalleled in traditional products. Masonry walls using these blocks and a special polyurethane mortar allow you to save on the costs of the mortar itself, the costs associated with its delivery and unloading, but above all, the time necessary to build the wall. By using polished blocks, a clean, optimal in terms of heat and sound insulation and a quickly erected wall is obtained. The types of blocks covered by this EPD are listed in Table 1.

Table 1. Types and dimensions of produced ceramic blocks

Name	Dimension
MEGA-MAX 250 P+W	375/250/238
miniMAX 115/238 P+W	465/115/238
MEGA-MAX 300/238 P+W	248/300/238
MEGA-MAX 188 P+W GR.3	465/188/242
SUPER-MAX/PRO MAX 250	375/250/249
SUPER-MAX/PRO MAX 115	465/115/249

Technical data for product can be found at manufacturer's website.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Declared unit

Declared unit is 1 ton of clay bricks and ceramic elements products (averaged, 600-800 kg/m^3).

Allocation

The allocation rules used for this EPD are based on general ITB PCR A (2023). Production of ceramic blocks is a line process executed by of CERPOL Sp. z o. o. in plant located in Kozłowice (Poland). Allocation was done on product mass basis. All impacts from raw materials extraction and processing are allocated in module A1 of the LCA. Impacts from the global line production of CERPOL Sp. z o. o. were inventoried and 100% were allocated ceramic blocks. Water and energy consumption, associated emissions and generated wastes are allocated to module A3. Packaging materials were taken 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, 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. Thus, material and energy flows contributing less than 1 % of mass or energy have been considered. 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 (80% mass input) are produced onsite. Additives like slag and packaging materials are sourced from domestic and foreign suppliers. 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 blocks begins with the extraction of clay as the main production raw material. Clay is extracted from a heap located near the production plant. First, the extracted clay is crushed and mixed with cellulose, slag and other specific additives. The next stage is forming the blocks and drying them. After drying the blocks, they are fired in tunnel klin. In the production process, constant quality checks are carried out at all stages, and the company has its own research laboratory. Ready blocks that have passed quality control are packed and sent to customers. The diagram of the production process is shown in Fig. 2.

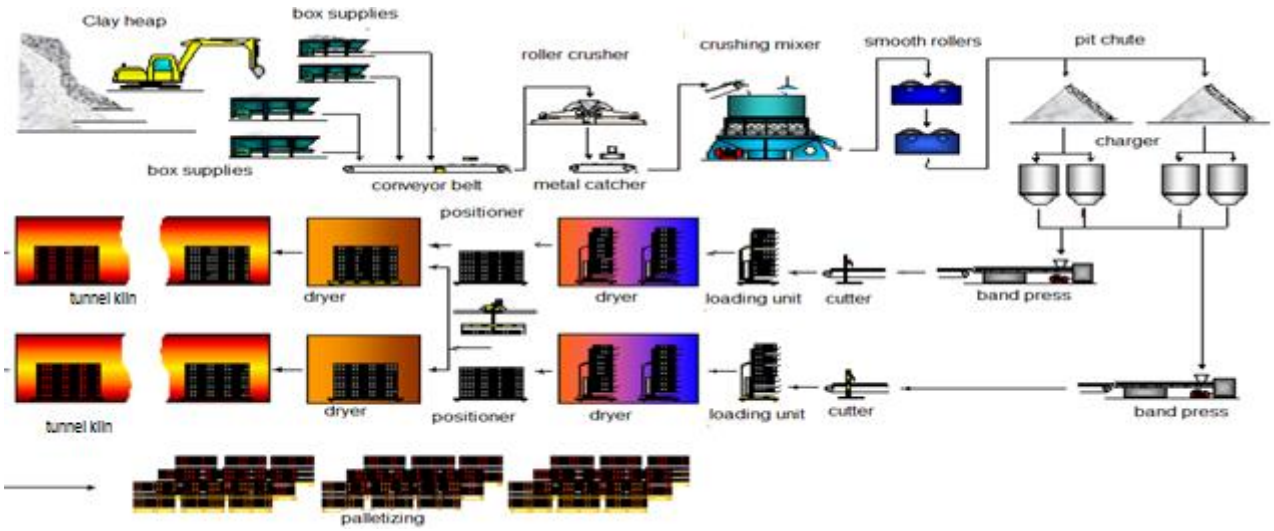

Figure 2. Production process scheme (A3)

Module A4: *Transport to a construction site*

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

Modules *C1-C4 and D: End-of-life (EoL)*

In the adapted scenario, dismantling of clay bricks and elements (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 clay bricks and elements 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 clay bricks and elements 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 90% of the clay bricks and elements is recycled and further used as aggregate for road foundation or ballast (credits presented in module D) while remaining 10% 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 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 blocks

Material	Material recovery	Recycling	Landfilling
Ceramic waste	100 %	90 %	10 %

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 quality

The data selected for LCA originate from ITB-LCI questionnaires (manufacturing plant) completed by producer and verified via 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 are judged as good. The background data for the processes come from the following

resources database Ecoinvent v.3.10 (minerals, additives, energy carriers, waste treatment, and packaging). The background data for energy is national based on KOBiZE reports (Polish electricity mix and combustion factors for fuels). Specific (LCI) data quality analysis was a part of the input data verification.

Data collection period
The data for manufacture of the declared products refer to period between 01.01.2023 – 31.12.2023 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Assumptions and estimates
The impacts of ceramic blocks were aggregated using weighted average.

Calculation rules
LCA was done in accordance with ITB PCR A document (1.6, 2023).

Databases
The data for the processes come from the following databases: Ecoinvent v.3.10, specific EPDs, ITB-Database. Specific data quality analysis was a part of external audit.

Additional information
Polish electricity mix used (production) is 0.685 kg CO_2/kWh (KOBiZE 2023). European electricity mix used is 0.430 kg CO_2/kWh for the end of life (Ecoinvent v3.10, RER).

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit
The declaration refers to declared unit (DU) – 1 ton of ceramic blocks produced by Sp. z o. o.

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**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MD**	**MD**	**MD**	**MD**	**MD**

Table 4 Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO_2	1.87E+00	4.10E+00	7.69E+01	8.29E+01	1.67E+01	3.43E+00	1.67E+01	1.50E+01	1.06E+00	-9.00E+00
Greenhouse potential - fossil	eq. kg CO_2	4.33E+01	4.09E+00	7.69E+01	1.24E+02	1.66E+01	3.43E+00	1.66E+01	1.50E+01	1.05E+00	-9.00E+00
Greenhouse potential - biogenic	eq. kg CO_2	-4.15E+01	1.40E-02	2.00E-01	-4.13E+01	5.68E-02	9.23E-03	5.68E-02	5.11E-02	1.06E-02	-5.40E-04
Global warming potential - land use and land use change	eq. kg CO_2	6.73E-02	1.61E-03	8.13E-03	7.71E-02	6.52E-03	5.36E-04	6.52E-03	5.87E-03	1.07E-03	-4.13E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	6.47E-07	9.46E-07	5.71E-06	7.30E-06	3.85E-06	1.88E-08	3.85E-06	3.46E-06	3.20E-07	-1.69E-06
Soil and water acidification potential	eq. mol H+	3.55E-01	1.66E-02	4.34E-01	8.06E-01	6.75E-02	3.62E-02	6.75E-02	6.07E-02	8.88E-03	-3.78E-01
Eutrophication potential - freshwater	eq. kg P	1.51E-02	2.75E-04	6.13E-02	7.67E-02	1.12E-03	5.90E-03	1.12E-03	1.01E-03	3.06E-04	-1.37E-02
Eutrophication potential - seawater	eq. kg N	7.61E-02	5.01E-03	7.11E-02	1.52E-01	2.04E-02	5.13E-03	2.04E-02	1.83E-02	3.06E-03	-3.36E-02
Eutrophication potential - terrestrial	eq. mol N	8.60E-01	5.46E-02	5.85E-01	1.50E+00	2.22E-01	4.47E-02	2.22E-01	2.00E-01	3.33E-02	-4.51E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	2.56E-01	1.67E-02	1.90E-01	4.63E-01	6.80E-02	1.29E-02	6.80E-02	6.12E-02	9.64E-03	-1.08E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	7.21E-03	1.45E-05	5.60E-05	7.28E-03	5.89E-05	1.29E-06	5.89E-05	5.30E-05	3.56E-06	-2.68E-03
Abiotic depletion potential - fossil fuels	MJ	5.67E+02	6.07E+01	1.32E+03	1.95E+03	2.47E+02	5.41E+01	2.47E+02	2.22E+02	2.43E+01	-3.16E+02
Water deprivation potential	eq. m^3	1.20E+01	2.81E-01	1.27E+01	2.49E+01	1.14E+00	1.03E+00	1.14E+00	1.03E+00	1.41E-01	-2.34E+01

Table 5 Life cycle assessment (LCA) results for specific product – additional impacts indicators (DU: 1 ton)

Indicator	Unit	A1-A3	A4	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 specific product - the resource use (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	-2.00E+01	8.71E-01	4.73E+01	2.64E+01	3.54E+00	4.45E+00	3.54E+00	3.19E+00	4.27E-01	-3.63E+01
Consumption of renewable primary energy resources used as raw materials	MJ	2.23E+02	0.00E+00	0.00E+00	2.23E+02	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	2.03E+02	8.71E-01	4.73E+01	2.51E+02	3.54E+00	4.45E+00	3.54E+00	3.19E+00	4.27E-01	-3.63E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	5.39E+02	6.07E+01	1.41E+03	1.15E+03	2.47E+02	5.41E+01	2.47E+02	2.22E+02	2.63E+01	-3.16E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	2.85E+01	0.00E+00	0.00E+00	2.85E+01	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	5.68E+02	6.07E+01	1.41E+03	2.03E+03	2.47E+02	5.41E+01	2.47E+02	2.22E+02	2.63E+01	-3.16E+02
Consumption of secondary materials	kg	2.05E+02	2.03E-02	1.14E-01	2.05E+02	8.27E-02	4.70E-03	8.27E-02	7.44E-02	0.00E+00	-1.91E-01
Consumption of renew. secondary fuels	MJ	5.66E-01	2.24E-04	3.96E-04	5.67E-01	9.11E-04	2.37E-05	9.11E-04	8.20E-04	0.00E+00	-1.16E-02
Consumption of non-renewable secondary fuels	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
Net consumption of freshwater	m^3	3.02E-01	7.64E-03	1.95E+00	2.26E+00	3.10E-02	1.55E-01	3.10E-02	2.79E-02	3.79E-03	-5.73E-01

Table7. Life cycle assessment (LCA) results for specific product – waste categories (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	7.60E+00	6.81E-02	5.30E+00	1.30E+01	2.77E-01	4.19E-01	2.77E-01	2.49E-01	3.83E-05	-2.21E+00
Non-hazardous waste	kg	9.39E+01	1.21E+00	2.89E+02	3.84E+02	4.92E+00	2.82E+01	4.92E+00	4.42E+00	1.00E+02	-6.15E+01
Radioactive waste	kg	7.05E-04	4.53E-06	2.60E-04	9.70E-04	1.84E-05	8.12E-06	1.84E-05	1.66E-05	1.48E-04	-8.34E-04
Components for re-use	kg	0.00E+00	0.00E+00	5.00E+00	5.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	1.58E-02	1.88E-04	1.00E+01	1.00E+01	7.64E-04	3.63E-04	7.64E-04	6.87E-04	0.00E+00	-4.28E-03
Materials for energy recovery	kg	6.82E-05	1.52E-06	1.19E-05	8.16E-05	6.18E-06	5.83E-07	6.18E-06	5.56E-06	0.00E+00	-3.98E-04
Exported Energy	MJ	5.90E+01	0.00E+00	2.21E+00	6.12E+01	0.00E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	-8.59E-01

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 (subclause 8.1.3.) ☒ external ☐ internal
External verification of EPD: PhD. Eng. Halina Prejzner LCI audit and verification: Filip Poznański, 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 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: 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 771-1:2011+A1:2015 Specification for masonry units Clay masonry units
- KOBiZE Wskaźniki emisyjności CO_2, SO_2, NO_x, CO i pyłu całkowitego dla energii elektrycznej, grudzień 2023
- https://ecoinvent.org/

Signature Not Verified
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Thermal Physics, Acoustics and Environment Department
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CERTIFICATE № 631/2024
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Ceramic blocks

Manufacturer:

CERPOL Sp. z o.o.
ul. Nowa 4, Kozłowice, 46-310 Gorzów Śląski, 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 30th April 2024 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, April 2024