Porotherm

Solution for brickwork

# Environmental Product Declaration

*according to EN 15804 and ISO 14025*

Porotherm Profi
Porotherm T Profi
Porotherm EKO+
Porotherm EKO+ Profi
Porotherm P+D
Porotherm AKU
Porotherm AKU Profi
Porotherm VT
Porotherm VT Profi
CSN clay blocks
MIAKO

Approval number: 3013EPD-20-0094
Approval date: 03/2020
Valid until: 03/2025
Revision: 1

Wienerberger

## 1. General information

| | |
|---|---|
| **Manufacturing company** | Wienerberger s.r.o.<br>Registration No.: 00015253<br>VAT No.: CZ00015253 |
| **Production sites** | 3217 - Řepov, Řepov 43, 293 01, Mladá Boleslav, Czech Republic<br>3220 - Novosedly 365, 691 82 Novosedly na Moravě, Czech Republic<br>3222 - Týn nad Vltavou, K Jihotvaru 418, 375 01 Týn Nad Vltavou, Czech Republic<br>3227 - Holice, 534 01 Holice, Czech Republic<br>3240 - Kostelec, Hálkova 1359, 517 41 Kostelec nad Orlicí, Czech Republic<br>3241 - Jezernice, 751 31 Jezernice, Czech Republic<br>3276 - Šlapanice, Hřbitovní 1643, 664 51 Šlapanice, Czech Republic |
| **Address** | Plachého 388/28<br>370 01 České Budějovice 1<br>Czech Republic |
| **Contacts** | Phone: +420 383 826 111, +420 727 326 111<br>E-mail: info@wienerberger.cz<br>Web: https://wienerberger.cz/ |

| | |
|---|---|
| **EPD Program** | National Environmental Labelling Program.<br>For more information see www.cenia.cz<br><br>CENIA, Czech Environmental Information Agency,<br>Vršovická 1442/65, Prague 10, 100 10 Czech Republic |
| **Approval number** | 3013EPD-20-0094 |
| **Approval date** | 03/2020 |
| **Valid until** | 03/2025 |
| **PCR identification** | EN 15804:2012+A1:2013 Sustainability of construction works – Environmental product declarations (Core rules for the product category of construction products) |
| **LCA prepared by** | Lubos Nobilis, ECO trend s.r.o., Na Dolinach 128, 140 00 Prague 4, Czech Republic, nobilis@ecotrend.cz |

**CEN standard EN 15804+A1 serves as the core PCR**

**Independent verification of the declaration and data, according to EN ISO 14025**

| **Internal** | **External** |
|---|---|
| ☐ | ☒ |

Third party verifier:
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## About the company

Wienerberger s.r.o. is a part of the Wienerberger AG group, which is the world's largest manufacturer of clay blocks and Europe's largest manufacturer of clay tiles. The company's headquarters is in České Budějovice 1, Plachého 388/28, PSČ 370 01, Czech Republic. The company is registered in the Business Register kept by the Regional Court in České Budějovice, Section C, rider 27563 dated 29 December 1990.

- Business Reg. No. 00015253
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In its seven manufacturing plants / brickworks, Wienerberger s.r.o. makes a complex portfolio of Porotherm products, which consists of porous clay wall materials, ceiling clay blocks or other brick products required to manufacture ceramic-concrete prefabricated elements (brick shapes – U-shaped semi-products), i.e. lintels and ceiling beams.

The headquarters of the company is located in the historical centre of České Budějovice. The Porotherm brick product manufacturing plants are situated near Řepov (at Mladá Boleslav), Novosedla na Moravě, Týn nad Vltavou, Holice, Kostelec nad Orlicí, Šlapanice (near Brno) and Jezernice. The Jezernice manufacturing plant, which is the only Wienerberger building in the Czech Republic built as a greenfield project, was commissioned in 2005 as one of the most advanced clay blocks manufacturing plants in Europe. Since 1995, the other manufacturing plants have been undergoing renovations and modernizations one by one in order to reduce the power demands of the manufacturing and the environmental impact. All the manufacturing plants are equipped with a stilling station used to process the fumes at the outlet of the manufacturing process and using the waste heat from the oven aggregate to dry pressings prior to the brick burning itself.

Brickworking has more than a hundred years of tradition in the Řepov facility. The brick plant manufactures transverse clay blocks, slab edge blocks, ceiling clay blocks and semi-products for the ceramic-concrete lintel and ceiling beam manufacturing plant, which was built in 1999 in close proximity to the brick plant. These products of plant Řepov - lintels and ceiling beams - are subject to a separate EPD.

## 2. Product

### 2.1 Product description

Clay blocks belong to the group of burnt clay building materials. This EPD concerns the average brick produced at seven production plants in the Czech Republic – Holice, Kostelec nad Orlicí, Týn nad Vltavou, Řepov, Jezernice, Novosedly na Moravě and Šlapanice brick plant. Values were calculated separately for bricks from each individual plant. The different recipes and the efficiency of the individual plant technologies were taken into account. The T Profi bricks from Novosedly plant, which are infilled by mineral wool, are represented separately. These are all extruded bricks.

Technical lifetime of bricks is 150 years.

### 2.2 Application

Clay blocks are of different types for external and internal loadbearing and non-loadbearing walls and building elements, in combination with masonry mortar or with masonry PU-glue.

**Porotherm**

The **Porotherm** brick blocks are masonry units with the height of 238 mm, designated for setting on a mortar bed joint with an average thickness of 12 mm, whereas their beds are not ground. The headers are fitted with the tongue and groove system so that the bricks interlock and the joints do not need to be filled with the joint mortar. They are designated for protected bearing and non-bearing masonry, for thermally insulating or interior masonry, they are made for the wall thickness from 80 to 440 mm.

*Photo 1 - Water jet cutting of mineral wool thermal insulation boards for pads inserted into bricks*

*Photo 2 - Thermal insulating pads prepared at carousel*


*Photo 3 - Industrial robot for inserting thermal insulation pads into brick blocks*

*Photo 4 - Inserting thermal insulation into brick blocks*

### Porotherm Profi

The **Profi** brick blocks are high-precision masonry units with the height of 249 mm, designated for setting on a thin bed joint with the thickness of 0.5 to 1.0 mm, whereas their beds are ground so that the brick height is achieved with the precision of ±0.3 mm. The headers are fitted with the tongue and groove system so that the bricks interlock and the joints do not need to be filled with the joint mortar. They are designated for protected bearing and non-bearing masonry, for thermally insulating or interior masonry, the intended use thereof is given by the brick type (Profi, AKU Profi, EKO+ Profi, T Profi, VT Profi - see below). They are made for the wall thickness from 80 to 500 mm.

### Porotherm AKU (SYM)

The **Porotherm AKU** (with toothed joints) or **Porotherm AKU SYM** (with mortar pockets in joints) brick blocks are masonry units with the height of 238 mm, designated for setting on a mortar bed joint with an average thickness of 12 mm, whereas their beds are not ground. They are designated for protected bearing and non-bearing masonry used for protection against both external and internal noise. They have excellent acoustic and heat-accumulation properties and are made for the wall thickness from 115 to 300 mm.

### Porotherm AKU Profi

The **Porotherm AKU Profi** brick blocks are designated for protected bearing and non-bearing masonry, for single-layer wall with the thickness of 115 to 300 mm (without rendering), for double walls between terraced houses or semi-detached houses, as well as for external walls with the thickness of 250 and 300 mm, fitted with contact thermal insulation system in places with higher noise levels.

### Porotherm EKO+ Profi

The **Porotherm EKO+ Profi** brick blocks are masonry units with very fine structure of webs, made of highly porous brick material and with special toothing shape in joints. Thanks to their excellent thermally insulating properties, they are designated for protected bearing and non-bearing external thermally insulating masonry.

### Porotherm T Profi

The **Porotherm T Profi** brick blocks are masonry units with robust webs and shells of highly porous brick material with large internal voids, fully filled with pads of hydrophobic mineral wool. Thanks to their excellent thermally insulating properties, they are designated for protected bearing and non-bearing external thermally insulating masonry.

### Porotherm VT

The **Porotherm VT** brick blocks are masonry units with the thickness of 80 mm, designated for walling in the reinforced wall beams of the external brickwork. The thermal insulation with thickness corresponding to the thermal insulation properties of the external wall is inserted between these bricks and the wall beam. They are set in the outer face of the wall onto the mortar bed joint with an average thickness of 12 mm.

### Porotherm VT Profi

Unlike the Porotherm VT bricks, the **Porotherm VT Profi** brick blocks are ground to the height of 249 mm, application thereof in construction is identical. An advantage is to set them on the polyurethane masonry foam.

### MIAKO PTH

The **MIAKO PTH** clay ceiling blocks are used in the ceiling beam-and-block system where they are dry-suspended between the ceiling beams with their nibs. They are made in the height of 150, 190, 230 and 80 mm for two distances between the beam axis - 625 and 500 mm.

## 2.3 Technical Data

| | |
|---|---|
| Product group name | T Profi, EKO+ Profi, Profi, AKU etc. |
| Bed surface type | grinded (G) x non-grinded (NG) |
| Wall thickness | cm |
| Recommended use | TI – thermal insulating one layer masonry<br>LB – load-bearing masonry<br>NLB – non load-bearing masonry<br>AC – acoustic masonry<br>CC – ceiling construction<br>CCB – ceiling clay block |

## Plant Kostelec nad Orlicí

| Product group name | Bed surface type | Wall thickness | Recommended use |
|---|---|---|---|
| Porotherm | NG | 44 | TI, LB, NLB |
| | | 40 | |
| | | 38 | |
| | | 36,5 | |
| | | 30 | LB, NLB |
| | | 24 | |
| | | 17,5 | |
| | | 14 | |
| | | 11,5 | NLB |
| | | 8 | |
| Porotherm AKU | NG | 11,5 | NLB |

## Plant Řepov

| Product group name | Bed surface type | Wall / CCB thickness / height | Recommended use |
|---|---|---|---|
| Porotherm Profi | G | 11,5 | NLB |
| | | 8 | |
| Porotherm VT Profi | G | 8/21 | TI, LB, NLB |
| | | 8/25 | |
| | | 8/29 | |
| Porotherm | NG | 11,5 | NLB |
| | | 8 | |
| Porotherm VT | NG | 8/19,5 | TI, LB, NLB |
| | | 8/23,8 | |
| | | 8/27,5 | |
| MIAKO 62,5 PTH | NG | 15 | CC |
| | | 19 | |
| | | 23 | |
| | | 8 | |
| MIAKO 50 PTH | NG | 15 | CC |
| | | 19 | |
| | | 23 | |
| | | 25 | |
| MIAKO 62,5 BNK | NG | 25 | CC |
| MIAKO 50 BNK | | 25 | |

## Plant Novosedly na Moravě

| Product group name | Bed surface type | Wall thickness | Recommended use |
|---|---|---|---|
| Porotherm T Profi | G | 50 | TI, LB, NLB |
| | | 44 | |
| | | 38 | |
| | | 30 | |
| Porotherm EKO+ Profi | G | 44 | TI, LB, NLB |
| | | 40 | |
| Porotherm Profi | G | 30 | LB, NLB |
| | | 24 | |
| | | 14 | |
| | | 11,5 | NLB |
| Porotherm AKU Profi | G | 19 | AC, LB, NLB<br>LB, NLB |
| Porotherm | NG | 30 | |
| | | 24 | |
| | | 14 | |
| | | 11,5 | NLB |
| Porotherm AKU | NG | 19 | AC, LB, NLB |

## Plant Týn nad Vltavou

| Product group name | Bed surface type | Wall thickness | Recommended use |
|---|---|---|---|
| Porotherm Profi | G | 44 | TI, LB, NLB |
| | | 40 | |
| | | 38 | |
| | | 36,5 | |
| | | 30 | LB, NLB |
| | | 24 | |
| | | 17,5 | |
| | | 14 | |
| | | 11,5 | NLB |
| Porotherm | NG | 40 | TI, LB, NLB |
| | | 36,5 | |
| | | 30 | LB, NLB |
| | | 24 | |
| | | 17,5 | |
| | | 14 | |
| | | 11,5 | NLB |

## Plant Holice

| Product group name | Bed surface type | Wall thickness | Recommended use |
|---|---|---|---|
| Porotherm AKU Profi | G | 30 | AC, LB, NLB |
| | | 25 | |
| | | 19 | |
| | | 11,5 | AC, NLB |
| Porotherm AKU SYM | NG | 30 | AC, LB, NLB |
| | | 25 | |
| Porotherm AKU | NG | 30 | AC, LB, NLB |
| | | 25 | |
| | | 19 | |
| | | 11,5 | AC, NLB |

## Plant Jezernice

| Product group name | Bed surface type | Wall thickness | Recommended use |
|---|---|---|---|
| Porotherm EKO+ Profi | G | 50 | TI, LB, NLB |
| | | 44 | |
| | | 40 | |
| Porotherm Profi | G | 44 | TI, LB, NLB |
| | | 40 | |
| | | 38 | |
| | | 36,5 | |
| | | 30 | LB, NLB |
| | | 25 | |
| | | 24 | |
| | | 17,5 | |
| | | 14 | |
| | | 11,5 | NLB |
| Porotherm | NG | 38 | TI, LB, NLB |
| | | 30 | LB, NLB |
| | | 24 | |
| | | 17,5 | |
| | | 14 | |
| | | 11,5 | NLB |

## Plant Šlapanice

| Product group name | Bed surface type | Wall thickness | Recommended use |
|---|---|---|---|
| Porotherm Profi | G | 30 | LB, NLB |
| | | 24 | |
| | | 17,5 | |
| | | 11,5 | NLB |
| Porotherm AKU | NG | 19 | AC, LB, NLB |

## 2.4 Base materials / Ancillary materials

Product does not contain Substance of Very High Concern.

*Products content declaration*

| Materials / components | Substances | CAS number | weight | | | |
|---|---|---|---|---|---|---|
| | | | Holice site | Jezernice site | Kostelec site | Šlapanice site |
| Clay | - | - | 63,55 % | 72,50 % | 94,80 % | 83 % |
| Slag | - | - | 19,14 % | 7,70 % | 5,20 % | - |
| Sand | - | - | 9,45 % | 19,80 % | - | 17 % |
| Ash | - | - | 6,24 % | - | - | - |
| Inert dust | - | - | 1,62 % | - | - | - |

Ancillary materials: Ancillary materials are used to create an optimal internal structure and burn out during production. The lignite, sludge from paper production or wooden chips are used for this purpose.

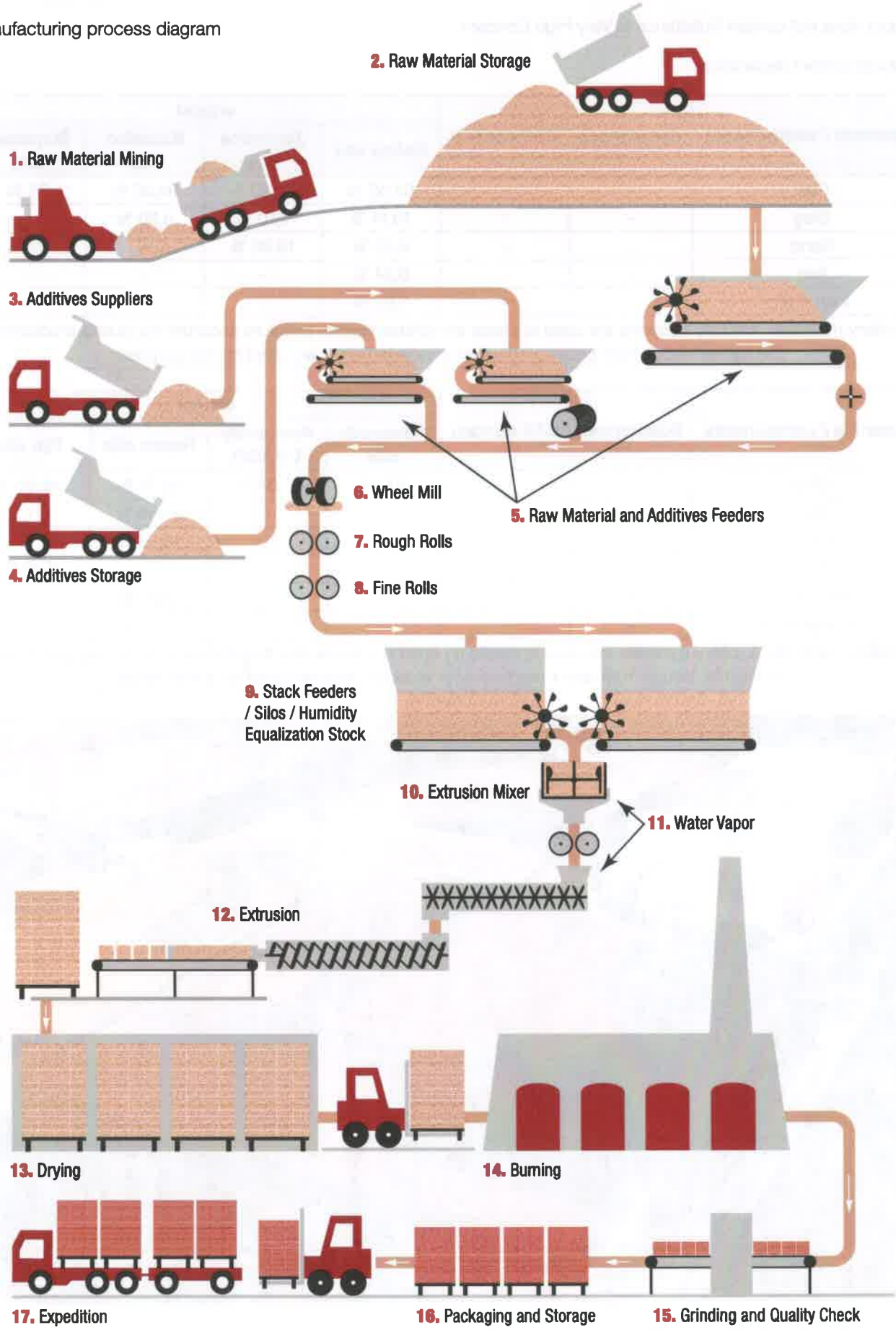
| Materials / components | Substances | CAS number | weight | | | |
|---|---|---|---|---|---|---|
| | | | Novosedly site | Novosedly T PROFI | Řepov site | Týn site |
| Clay | - | - | 100 % | 97,34 % | 59,74 % | 96,61 % |
| Slag | - | - | - | - | 20,96 % | 1,17 % |
| Sand | - | - | - | - | 19,23 % | - |
| Ash | - | - | - | - | - | 2,22 % |
| Inert dust | - | - | - | - | 0,07 % | - |
| Mineral wool | - | - | - | - | 2,66 % | - |

Ancillary materials: Ancillary materials are used to create an optimal internal structure and burn out during production. The lignite, sludge from paper production or wooden chips are used for this purpose.

*Photo 5 - Manufacturing plant Jezernice*

## 2.5 Manufacture

Manufacturing process diagram



## 2.6 Environment and health during manufacturing

In face of the manufacturing conditions, no particular statutory or regulatory health protection measures are required. Air form manufacturing is cleaned in accordance with statutory specifications. Emissions are significantly below the requisite limit values.
Production is free of waste water.
Waste products from production are internally recycled.

## 2.7 Product processing/Installation

Ceramic facing bricks are used in combination with regular mortar or with PU-glue, corresponding to the suction rate of the brick, for construction of masonry walls. The masonry can be load bearing or non-load bearing.
Brick masonry should be executed in accordance with the /NS 3420-N:2012/ Specification text for building, construction and installation part N: masonry and rigid tile work.
The labels on the brick pallets are marked with safety signs, recommending use of protective equipment during installation, such as protective footwear, protective glasses, hearing protection, and gloves when handling bricks. Cutting bricks with electric tools can produce dust containing silicates and quarts particles that might cause health damages, dust mask FFP3 is recommended.

## 2.8 Packaging

PE plastic films and tapes and paper labels are used on each pallet. The bricks are delivered on returnable wood pallets.

## 2.9 Condition of use

The composition of the brick block is as stated in the chapter "Base materials". There will be no alteration in the content of the brick or the properties of the brick block during the technical life time of the product.
All fillers are burned during manufacturing, and the brick block is inert during the use phase (no emissions occur).

## 2.10 Environment and health during use

No damage to health and environment can be anticipated if Wienerberger products are used as designated.

## 2.11 Reference service life

Technical life of Wienerberger products time is 150 years, when used correctly.

## 2.12 Extraordinary effects

Fire

| | |
|---|---|
| Building material class according to EN 13501-1: | A1 |
| Smoke emission level: | s1 |
| Flaming droplets and/or particles production: | d0 |

Water
No impact.

Mechanical destruction
No environmental or health consequences are to be anticipated in the event of mechanical destruction.

## 2.13 Re-use phase

Re-use of clay blocks occur at different stages; clay block waste is re-used in brick production as crushed chamotte added to the clay.
Unbroken demolition clay blocks can be re-used in new masonry.
As clay blocks emit no harmful substances to air, soil or water, they can be used as aggregates in building material, aggregates to soil due to water retaining properties and aggregates in special soil for Green roofs.

## 2.14 Disposal

Wienerberger clay blocks comply with the European waste code 170102. If they cannot be re-used as stated in section 2.15, clay blocks can be disposed in landfills for inert material. They do not represent hazardous waste and there are no emissions to the environment to expect.

## 2.15 Further information

Further information is available at https://wienerberger.cz/.

# 3. LCA calculation information

## 3.1 Declared Unit

The declared unit is **1 000 kg** manufactured by production facility in Holice / Kostelec nad Orlicí / Týn nad Vltavou / Řepov / Jezernice / Novosedly / Šlapanice, all sites in the Czech Republic. The LCA calculation is made for average products of separately production sites. Differences among products of separately sites are only in shape and volume of bricks. Material and energy consumption of production is only product weight depended.

## 3.2 System boundary

Type of EPD: cradle to gate
The systems comprise the following stages in accordance with EN 15804:

Product stage, A1 - A3
This product stage is subdivided into 3 modules A1 (raw material supply), A2 (transport) and A3 (manufacturing). The aggregation of the modules A1, A2 and A3 is a possibility considered by the EN 15 804 standard. This rule is applied in this EPD.

*Raw material supply – A1*
This part takes into account the extraction and processing of all raw materials and energy which occurs upstream to the studied manufacturing process.
Specifically, the raw material supply covers sourcing (mining of clay) and production of other inputs – slag, ash etc.

*Transport to manufacturer and internal transport – A2*
The raw materials are transported to the manufacturing site. In this case, the modelling include road transportations (average values based on specific data) of each raw material.

*Manufacture – A3*
This module coverings manufacturing of products including drying, storing, mixing, extruding and packing.
The manufacturing process also collect data on the combustion of natural gas, diesel and gasoline, related to the production process.
Use of electricity, fuels and auxiliary materials in the production is taken into account too. The environmental profile of these energy carriers is modeled for local conditions.
Packaging-related flows in the production process and all up-stream packaging are included in the manufacturing module, i.e. PE foils and tapes and paper labels (cradle-to-gate).

Based on EN 15804 the downstream module was not included into system boundaries. Transport of final product to a costumer is also excluded.

The entire life cycle A1-C4 is not declared. Only modules A1-A3 are evaluated. Therefore there is no documentation for calculating the reference life added.

**Description of the system boundary** (X = included in the LCA, MND = Module Not Declared)

| Product stage | | | Construction stage | | Use stage | | | | | | | End of life stage | | | | Benefits and loads beyond the system boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Raw material supply | Transport | Manufacturing | Transport | Construction-Installation process | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-recovery |
| 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 | MND | MND | MND |

### 3.3 Cut-off criteria

All operating data was taken into consideration in the analysis. Accordingly, material flows with a share of less than 1% were also balanced. It can be assumed that the total of all neglected processes does not therefore exceed 5% in the impact categories.

Accordingly, the cut-off criteria in line with EN 15804 are complied with.

### 3.5 Background data

All of the relevant background data sets were taken from the Ecoinvent 3 database. The data used was recorded under consistent conditions in terms of time and methods. The SimaPro 8 was used for modelling the lifecycle.

### 3.6 Data quality

Data on the product under review was collected directly at the production facilities and refers to the production processes in 2016.

### 3.7 Period under review

The data refers to the manufacturing processes between 01. 01. 2016 and 31. 12. 2016. The data of Šlapanice site were used from year 2018.

### 3.8 Allocation

The data used were collected in the separate production facilities. Energy and fuels consumption were calculated on the basis of volumes used per cubic metre of a product.

### 3.9 Comparability

According to EN 15804, EPD of construction products may not be comparable if they do not comply with this standard.


*Photo 6 - Foil wrapping line for packing of pallets with finished products*

# 4. LCA results

## Environmental impacts

| Impact category | Unit | Holice | Jezernice | Řepov | Týn nad Vltavou | Kostelec n. Orlicí | Novosedly na Moravě | Novosedly T Profi | Šlapanice |
|---|---|---|---|---|---|---|---|---|---|
| Abiotic depletion | kg Sb eq | 1.76E-04 | 2.88E-04 | 2.16E-04 | 4.23E-04 | 3.47E-04 | 4.12E-04 | 5.23E-04 | 5.75E-05 |
| Abiotic depletion (fossil fuels) | MJ | 1.08E+03 | 1.79E+03 | 1.81E+03 | 1.77E+03 | 1.70E+03 | 2.24E+03 | 2.95E+03 | 1.53E+03 |
| Global warming (GWP100a) | kg CO2 eq | 1.32E+02 | 1.71E+02 | 2.20E+02 | 1.11E+02 | 1.42E+02 | 2.13E+02 | 2.78E+02 | 1.09E+02 |
| Ozone layer depletion (ODP) | kg CFC-11 eq | 1.15E-05 | 1.98E-05 | 1.98E-05 | 1.91E-05 | 1.79E-05 | 2.45E-05 | 2.83E-05 | 1.63E-05 |
| Photochemical oxidation | kg C2H4 eq | 9.25E-03 | 3.85E-02 | 2.46E-02 | 3.01E-02 | 2.90E-02 | 3.03E-02 | 6.03E-02 | 4.26E-01 |
| Acidification | kg SO2 eq | 9.85E-02 | 3.27E-01 | 3.89E-01 | 3.50E-01 | 3.39E-01 | 3.93E-01 | 8.91E-01 | 4.31E-01 |
| Eutrophication | kg PO4--- eq | -7.52E-01 | 8.14E-02 | 2.81E-01 | -2.05E-01 | 2.17E-01 | 1.41E-01 | 2.38E-01 | 2.54E-01 |

## Resource use

| Parameter | Units | Holice | Jezernice | Řepov | Týn nad Vltavou | Kostelec n. Orlicí | Novosedly na Moravě | Novosedly T Profi | Šlapanice |
|---|---|---|---|---|---|---|---|---|---|
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ, net calorific value | 2.15E+01 | 2.54E+01 | 8.74E+00 | 8.00E-01 | 2.67E+01 | 3.41E+01 | 3.41E+01 | 3.64E+01 |
| Use of renewable primary energy resources used as raw materials | MJ, net calorific value | 1.46E+02 | 1.33E+03 | 1.02E+02 | 9.80E+02 | 2.68E+02 | 1.06E+03 | 1.06E+03 | 9.50E+02 |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ, net calorific value | 1.68E+02 | 1.36E+03 | 1.10E+02 | 9.81E+02 | 2.95E+02 | 1.09E+03 | 1.09E+03 | 9.86E+02 |
| Use of non- renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ, net calorific value | 1.02E+03 | 1.45E+03 | 1.65E+03 | 2.00E+01 | 1.34E+03 | 1.83E+03 | 1.83E+03 | 1.35E+03 |
| Use of non- renewable primary energy resources used as raw materials | MJ, net calorific value | 2.68E+02 | 3.45E+02 | 1.93E+02 | 4.57E+01 | 9.27E+01 | 9.64E+02 | 1.67E+03 | 4.65E+01 |
| Total use of non- renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ, net calorific value | 1.29E+03 | 1.79E+03 | 1.85E+03 | 6.57E+01 | 1.43E+03 | 2.80E+03 | 3.51E+03 | 1.40E+03 |
| Use of secondary material | kg | 4.81E+02 | 1.73E+02 | 2.93E+02 | 1.19E+02 | 9.01E+01 | 7.20E+02 | 7.20E+02 | 0.00E+00 |
| Use of renewable secondary fuels | MJ, net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Use of non renewable secondary fuels | MJ, net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Use of net fresh water | $m^3$ | 2.37E-01 | 2.32E-01 | 2.32E-01 | 2.36E+00 | 2.93E-01 | 2.36E+00 | 2.36E+00 | 3.38E+01 |

## Waste categories

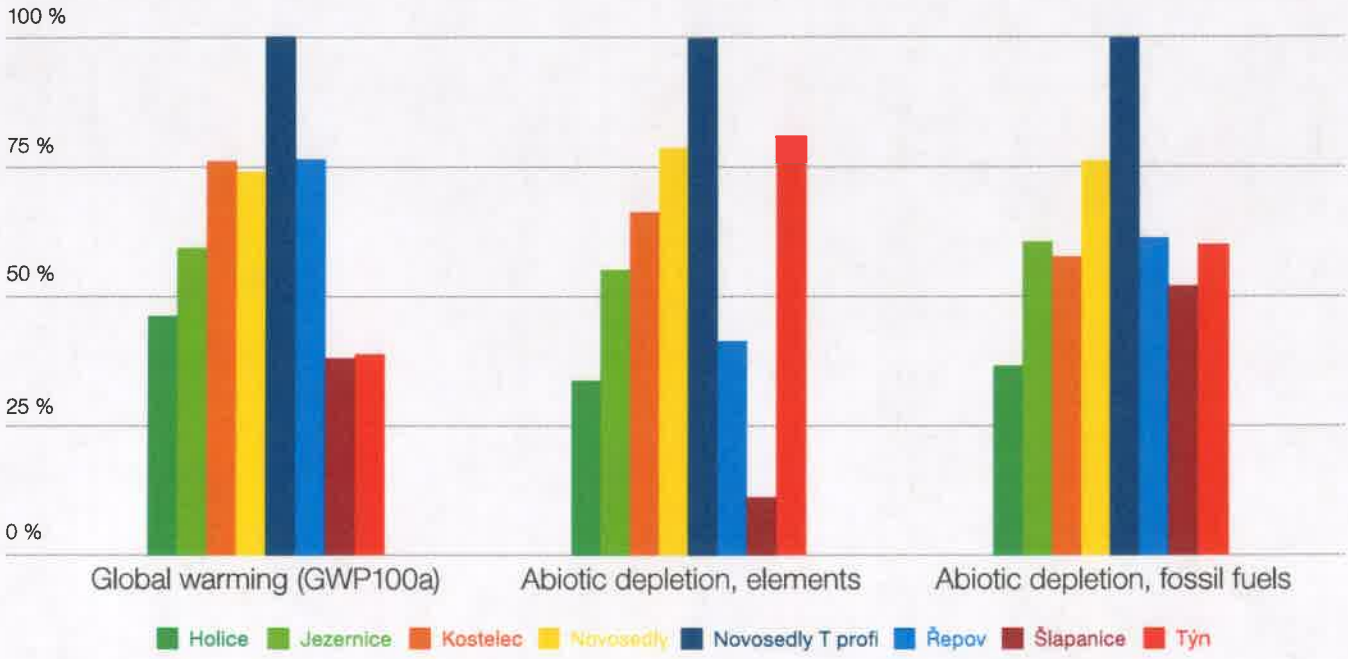
| Parameter | Units | Holice | Jezernice | Řepov | Týn nad Vltavou | Kostelec n. Orlicí | Novosedly na Moravě | Novosedly T Profi | Šlapanice |
|---|---|---|---|---|---|---|---|---|---|
| Hazardous waste | kg | 2.69E-02 | 2.43E-02 | 6.33E-03 | 2.69E-02 | 2.88E-04 | 2.69E-02 | 2.69E-02 | 8.84E-01 |
| Non-hazardous waste disposed | kg | 1.09E+00 | 1.69E-01 | 1.22E+01 | 1.09E+00 | 1.53E-01 | 1.09E+00 | 1.09E+00 | 8.45E-01 |
| Radioactive waste disposed/stored | 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 |

## Output flows

| Parameter | Units | Holice | Jezernice | Řepov | Týn nad Vltavou | Kostelec n. Orlicí | Novosedly na Moravě | Novosedly T Profi | Šlapanice |
|---|---|---|---|---|---|---|---|---|---|
| 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 |
| Materials for recycling | kg | 8.86E-04 | 1.75E-02 | 5.71E-01 | 3.05E-02 | 8.09E-02 | 2.13E-01 | 2.13E-01 | 4.18E-01 |
| Materials for energy recovery | 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 |
| Exported energy | MJ per energy carrier | 0,00E-00 | 0,00E-00 | 0,00E-00 | 0,00E-00 | 0,00E-00 | 0,00E-00 | 0,00E-00 | 0,00E-00 |

## 5. LCA: Interpretation

The following diagram represents results of the products comparison from individual sites in the impact categories Abiotic depletion (minerals), Abiotic depletion (fossil fuels) and Global warming (GWP 100a):




The differences in the results of the individual plants can mainly be attributed to the differences in the content of secondary materials in the input of raw materials. The higher ratio of secondary materials leads to better impact results (to lower impacts).

The highest value was for the T Profi product (designated in the graph as Novosedly mineral wool) includes mineral wool, which has also specific impact on the ecological assessment. This thermal insulation placed inside the brick replaces the auxiliary thermal insulation on a construction site, which is a permanent component of the ETICS system and which is normally used in new buildings. A standard ETICS system has significantly shorter durability than mineral wool inside (and thus protected) the T Profi products. In this case, the impact of mineral wool thermal insulation is already considered in the clay blocks itself and therefore will have a positive impact on the overall life cycle of a building. The T Profi product is the most complicated to manufacture but reduces the impacts of the building from the whole life cycle point of view. However, this advantage is not included and visible in the results.

## 6. References


1. EN 15804:2012+A1:2013 Sustainability of construction works – Environmental product declarations - Core rules for the product category of construction products
2. ISO 14025:2006 Environmental labels and declarations – Type III Environmental Declarations – Principles and procedures
3. ISO 14040:2006 Environmental management – Life Cycle Assessment – Principles and framework
4. ISO 14044:2006 Environmental management – Life Cycle Assessment – Requirements and guidelines

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