Tondach

Solution for pitched roofs

# Environmental Product Declaration

*according to EN 15804+A1 and ISO 14025*

## Clay Roofing Tiles

Stodo 12

Samba 11

Brněnka 14

Hranice 11

Figaro 11

Francouzská 14

Falcovka 11

*and other assortment from Stod and Hranice Tondach production sites*

| | |
|---|---|
| Approval number: | 3013EPD-22-0283 |
| Approval date: | 5. 10. 2022 |
| Validity until: | 4. 10. 2027 |
| Revision: | 0 |

Wienerberger

# 1. General information

| | |
|---|---|
| **Manufacturing company** | Wienerberger s.r.o.<br>Registration No.: 00015253<br>VAT No.: CZ00015253 |
| **Production site** | 3275-Hranice, Bělotínská 722, 753 01 Hranice, Czech Republic<br>3277-Stod, Stříbrská 369, 333 01 Stod, Czech Republic |
| **Address** | Plachého 388/28<br>370 01 České Budějovice 1<br>Czech Republic |
| **Contacts** | Phone: +420 383 826 111<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-22-0283 |
| **Approval date** | 5. 10. 2022 |
| **Valid until** | 4. 10. 2027 |
| **PCR identification** | EN 15804:2012+A1:2013 Sustainability of construction works – Environmental product declarations<br>(Core rules for the product category of construction products) |
| **LCA prepared by** | Luboš 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 ISO 14025** | |
| **Internal** ☐ | **External** ☒ |
| Third party verifier:<br>Mgr. Barbora Vlasatá<br>Building Research Institute – Certification Company Ltd.<br>Head of Certification Body for EPD<br>Pražská 16, 102 21 Prague 10 – Hostivař, Czech Republic<br>www.vups.cz; info@vups.cz | |

# About 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. N° 00015253
- VAT No. CZ00015253
- Phone: +420 383 826 111
- E-mail: info@wienerberger.cz
- Website: http://www.wienerberger.cz

In its two manufacturing plants /roof tile factories, Wienerberger s.r.o. makes a complex portfolio of Tondach roof tile products, which consists of up to ten types of field tiles and their ceramic accessories (ridge tiles, verge tiles, ventilation tiles etc.).

The headquarters of the company is located in the historical centre of České Budějovice. The Tondach roof tile product manufacturing plants are situated at Hranice (in Moravia) and Stod (near Pilsen). Both places have long time tradition of ceramic tile making. Hranice plant went through three big phases of modernization in last 25 years to be modern production facility with high capacity. Stod plant went through extensive modernization too and they are only two ceramic tiles plants in Czech Republic area. Both 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 kiln for drying process.

# 2. Product

### 2.1 UN CPC code

37320 Refractory bricks, blocks, tiles and similar refractory ceramic constructional goods, other than those of siliceous earths.

### 2.2 Product description

Ceramic roof tiles belong to the group of fired clay materials with great service life (100 years). The tiles are made of high--quality ceramic clay with durability against weather conditions. This EPD concerns the average roof tiles produced at 2 production plants in the Czech Republic – Hranice and Stod. They represent tiles and relevant ceramic accessories for 4 groups of basic shapes – Modern, Universal, Classic and Historic. They are produced in 3 types of surface - natural red roof tiles, more matt colours as engobed, and glossy glazed colours. This surface is solid part of product via ceramic bonds during firing process.

### 2.3 Application

These tiles are used for covering of pitched roofs (from the slope of 12°).

### 2.4 Technical data

Ceramic roof tiles are produces and tested according EN 1304:2005. Decleared characteristics are mechanical resistance, external fire performance, reaction to fire, water impermeability, dimensions and dimensional tolerances, durability (frost resistance) and release of regulated substances.

Plant Hranice

| Product name | Save roof pitch [°] | Minimal roof pitch [°] | Covering length [mm] | Covering width [mm] | Weight per piece [kg] | Pieces per m² | Tonne per m² |
|---|---|---|---|---|---|---|---|
| Figaro 11 | 30 | 20 | 340 - 385 | 238 | 3,7 | 10,9 | 0,040 |
| Samba 11 | 22 | 12 | 355 - 380 | 228 | 3,6 | 11,5 | 0,041 |
| Brněnka 14 | 30 | 20 | 280 - 340 | 204 | 2,9 | 14,5 | 0,042 |
| Hranice 11 | 30 | 20 | 340 - 400 | 232 | 3,6 | 10,8 | 0,039 |
| Francouzská 14 | 30 | 20 | 400 | 205 | 2,9 | 14,6 | 0,042 |

Plant Stod

| Product name | Save roof pitch [°] | Minimal roof pitch [°] | Covering length [mm] | Covering width [mm] | Weight per piece [kg] | Pieces per m² | Tonne per m² |
|---|---|---|---|---|---|---|---|
| Stodo 12 | 30 (25) | 20 | 232 - 363 | 230 | 3,5 | 12 | 0,042 |
| Falcovka 11 | 30 | 20 | 390 | 234 | 3,6 | 11,1 | 0,040 |
| Malý prejz | 40 | 35 | 320 | 74 - 121 (201) | 1,2 (2,1) | 32 | 0,053 |
| Velký prejz | 40 | 35 | 350 | 101 - 142 (240) | 1,6 (2,7) | 24 | 0,052 |

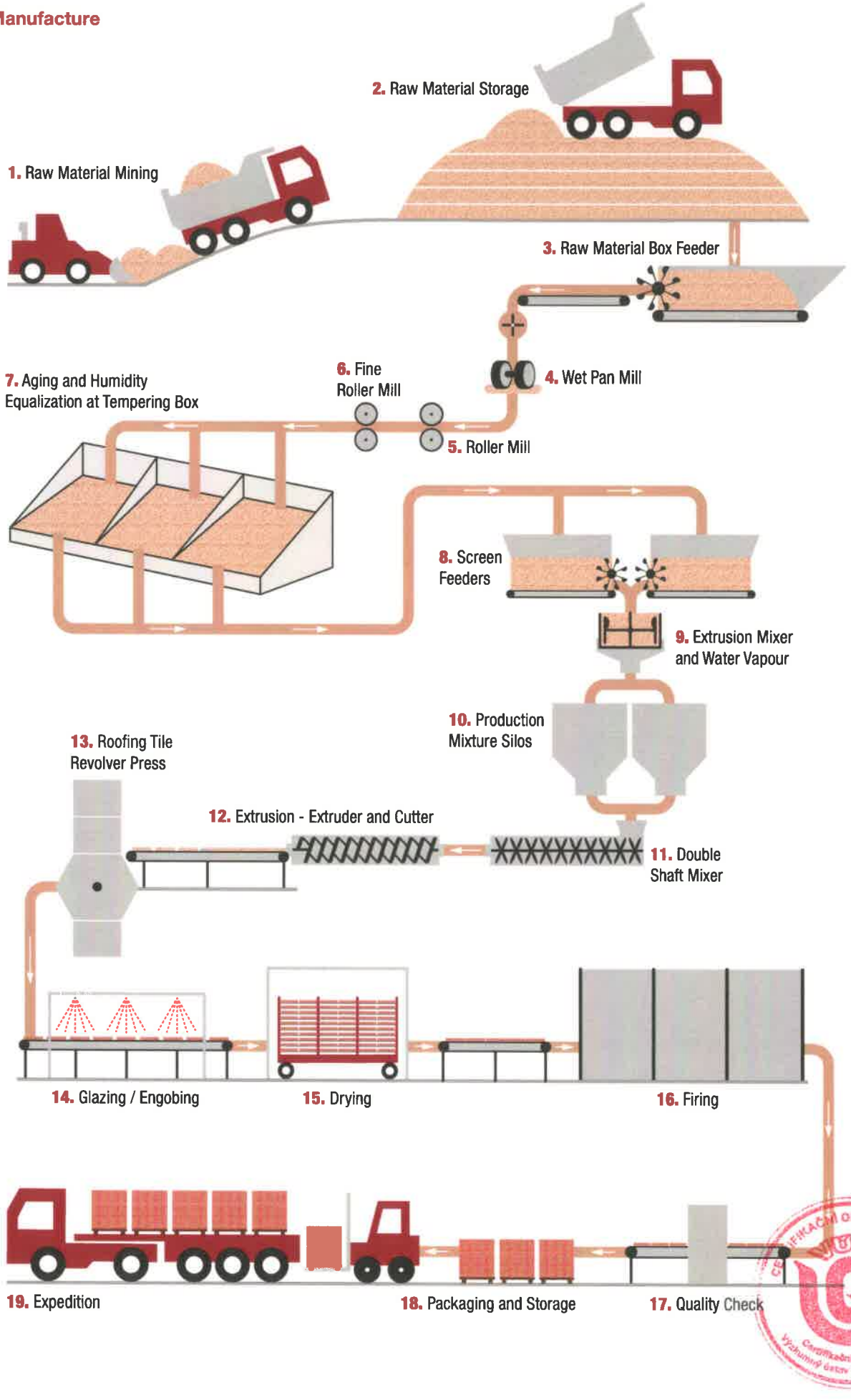
## 2.5 Base materials / Ancillary materials

Product does not contain Substance of Very High Concern.

*Products content declaration*

| Materials / components | Substances | Stod | Hranice |
|---|---|---|---|
| Clay | - | 99 % | 99 % |
| Gypsum | - | 0,002 % | 0,003 % |
| Sand | - | - | 0,002 % |
| Additives | - | 0,002 % | 0,00005 % |
| *Engoba (only for engobed products)* | *Clay, frits, pigments* | *0,002 %* | *0,004 %* |
| *Glaze (only for glazed products)* | *Clay, frits, pigments* | *0,005 %* | *0,002 %* |

## 2.6 Manufacture

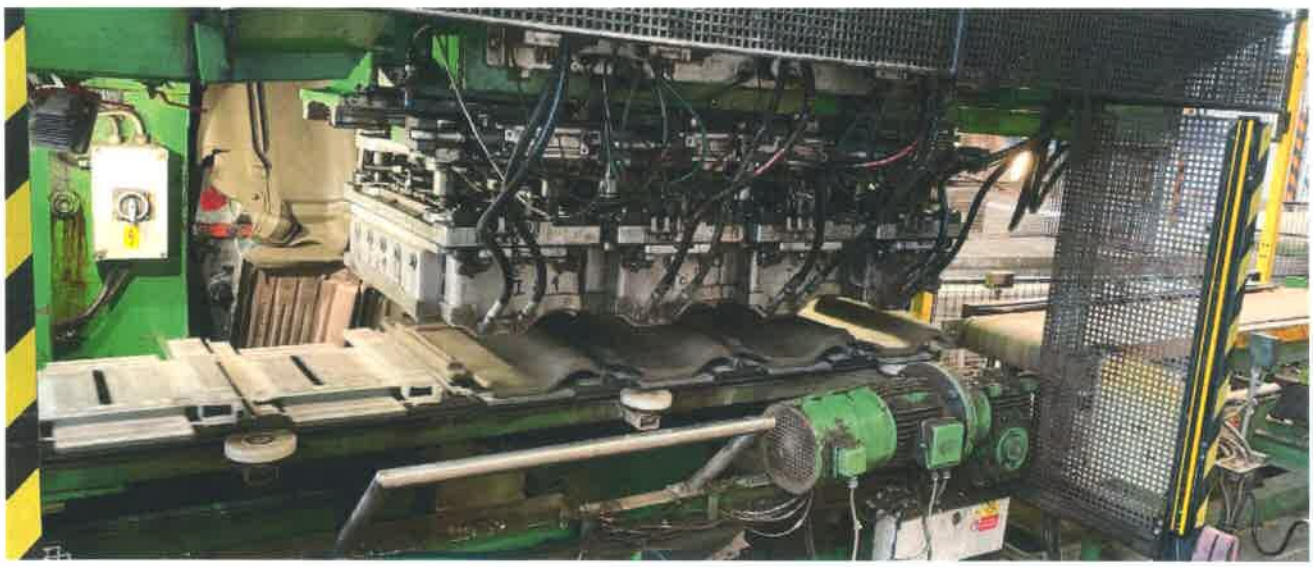


1 | *Tempering box*

2 | *Production mixture silo*

3 | *Extruder - double shaft mixer - screen feeder*

4 | *Revolver press (input)*

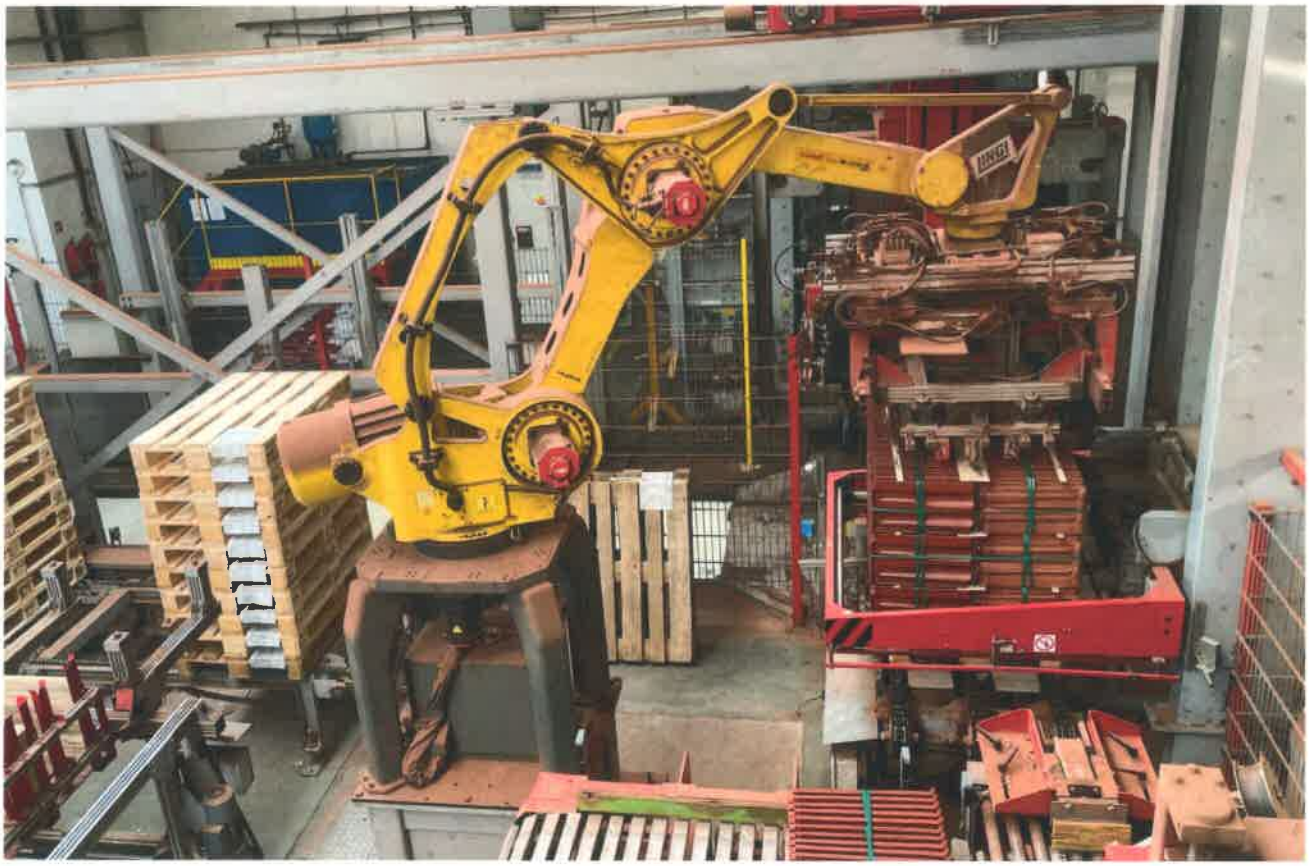


5 | *Revolver press (output)*

6 | *Glazing, engobing*

7 | *Loading kiln cars*

8 | *Kiln*



9 | *Packing, expedition*


10 | *Production plant Hranice*

### 2.7 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 wastewater.
Waste products from production are internally recycled.

### 2.8 Product processing/Installation

Roof tiles are installed on wooden roof structures.

### 2.9 Packaging

The cardboard, wooden prisms, plastic wrapping foils and steel tapes are used on packaging.

### 2.10 Condition of use

All products must be used according producer´s technical sheets, manuals and brochures, rules of Czech Guild of Plumbers, Roofers and Carpenters and standards as well.

### 2.11 Environment and health during use

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

### 2.12 Reference service life

Technical life of Tondach products time is 100 years, when used correctly. Product warranty is provided for 33 years.

### 2.13 Extraordinary effects

Fire
Building material class according to EN 13501-1: A1

Water
No impact

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

### 2.14 Re-use phase

Unbroken disassembled roof tiles can be re-used in new construction.
As clay roof tiles emit no harmful substances to air, soil or water, they can be used as aggregates in building material.

### 2.15 Disposal

Tondach roof tiles comply with the European waste code 170101. If they cannot be re-used as stated in section 2.14, products can be disposed in landfills for inert material. They do not represent hazardous waste and there are no emissions to the environment to expect.

### 2.16 Further information

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

# 3. LCA calculation information

## 3.1 Declared Unit

The declared unit is **1 tonne of each of type Tondach clay roof tiles** manufactured by production facilities in Stod and Hranice in 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.

## 3.2 System boundary

Type of EPD: cradle to grave
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 15804+A1 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.

*Transport to manufacturer and internal transport – A2*

The raw materials are transported to the manufacturing site. In this case, the modelling includes road transportations (average values based on specific data) of each raw material.

*Manufacture – A3*

This module coverings manufacturing of products including tiles manufacturing, drying, storing 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. cardboard, wooden prisms, wrapping foils and tapes.

**Construction process stage, A4 – A5**

*Transport – A4*

This module includes transport from the production gate to the building site.
Transport is calculated on the basis of a scenario with the parameters described in the following table:

| PARAMETER | VALUE |
|---|---|
| Fuel type and consumption of vehicle or vehicle type used for transport e.g. long-distance truck, boat, etc. | Average truck, tonnage 16-32 t, diesel |
| Distance | 150 km |
| Capacity utilization (including empty returns) | 100 % for tanker lorries<br>0 % of empty returns |
| Volume capacity utilization factor | 1 (by default) |

*Construction installation process – A5*
Roof tiles are assembled manually, without the use of mechanization and energy and fuel consumption. Roof structures (beams and battens) are not considered. The generation of packaging waste (cardboard, prisms and plastic foils and tapes) is considered at this stage.
It is assumed that packaging waste generated in the course of installation (composite paper and LD-PE bag) is 100% collected and sanitary landfilled. Wooden pallets are re-using and repairing if it is needed.

**Use stage, B1 – B7**
The use stage is divided into the following modules:
*Use – B1*
*Maintenance – B2*
*Repair – B3*
*Replacement – B4*
*Refurbishment – B5*
*Operational energy and water use – B6 and B7*
Once installation is complete, no actions or technical operations are required during the use stages until the end-of-life stage. The product does not require any energy, water or material input to keep it in working order. Furthermore, it is not exposed to the indoor atmosphere of the building, nor is it in contact with the circulating water or the ground. For this reason, no environmental loads are attributed to any of the modules between B1 and B7.

**End-of-life stage, C1 – C4**
The end-of-life stage is divided into the following modules:
*Deconstruction – C1*
The manual dismantling of the roof tiles is considered in this phase without the use of mechanization and energy and fuel consumption.
*Transport to waste processing – C2*
The model use for the transportation calculates 50 km to landfill.
*Waste processing – C3*
The product is considered to be recycled in volume of 70 %.
*Disposal – C4*
The impact of landfill of 30 % end-of-life product is taken into account according to available data.

**Reuse/recovery/recycling potential, D**
Post-consumer recycling scenarios are not considered within this EPD.

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

| **Product stage** | | | **Construct. stage** | | **Use stage** | | | | | | | **End of life stage** | | | | ***** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | X | X | X | X | X | X | X | X | X | X | X | X | X | MND |

*** Benefits and loads beyond the system boundary**

### 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+A1 are complied with.

### 3.5 Background data

All of the relevant background data sets were taken from the Ecoinvent 3.8 database. The data used was recorded under consistent conditions in terms of time and methods. The SimaPro 9 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 2020.

### 3.7 Period under review

The data refers to the manufacturing processes between 01.01.2020 and 31.12.2020.

### 3.8 Allocation

The data used were collected in the separately production facilities. Energy and fuels consumption were calculated on the basis of volumes used per tonne of product.

### 3.9 Comparability

According to EN 15804+A1, EPD of construction products may not be comparable if they do not comply with this standard.

### 3.10 Geographical coverage and time period

Scope includes manufacture and trade in Czech Republic in 2020.

# 4. LCA results

## 4.1 Environmental impacts

### Environmental impacts – Unglazed tiles

| Impact category | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Abiotic depletion | kg Sb eq | 7.13E-04 | 9.58E-04 | 5.78E-04 | 8.23E-04 | 7.90E-05 | 0 | 0 | 0 | 2.63E-05 | 2.60E-05 | 3.49E-06 |
| Abiotic depletion (fossil fuels) | MJ | 6.14E+03 | 7.29E+03 | 5.48E+03 | 6.63E+03 | 3.69E+02 | 0 | 0 | 0 | 1.23E+02 | 1.19E+02 | 4.36E+01 |
| Global warming (GWP100a) | kg $CO_2$ eq | 4.26E+02 | 5.11E+02 | 3.84E+02 | 4.69E+02 | 2.47E+01 | 0 | 0 | 0 | 8.25E+00 | 7.79E+00 | 1.55E+00 |
| Ozone layer depletion (ODP) | kg CFC-11 eq | 7.03E-05 | 7.75E-05 | 6.23E-05 | 6.96E-05 | 4.59E-06 | 0 | 0 | 0 | 1.53E-06 | 1.32E-06 | 5.05E-07 |
| Photochemical oxidation | kg $C_2H_4$ eq | 4.95E-02 | 5.78E-02 | 4.34E-02 | 5.17E-02 | 3.19E-03 | 0 | 0 | 0 | 1.06E-03 | 1.41E-03 | 4.67E-04 |
| Acidification | kg $SO_2$ eq | 9.61E-01 | 1.13E+00 | 7.99E-01 | 9.69E-01 | 7.86E-02 | 0 | 0 | 0 | 2.62E-02 | 4.60E-02 | 1.12E-02 |
| Eutrophication | kg $PO_4$ eq | 6.46E-01 | 8.05E-01 | 6.06E-01 | 7.65E-01 | 1.75E-02 | 0 | 0 | 0 | 5.83E-03 | 1.42E-02 | 2.39E-03 |

### Environmental impacts – Engobe tiles

| Impact category | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Abiotic depletion | kg Sb eq | 8.36E-04 | 1.04E-03 | 7.01E-04 | 9.02E-04 | 7.90E-05 | 0 | 0 | 0 | 2.63E-05 | 2.60E-05 | 3.49E-06 |
| Abiotic depletion (fossil fuels) | MJ | 6.16E+03 | 7.30E+03 | 5.51E+03 | 6.65E+03 | 3.69E+02 | 0 | 0 | 0 | 1.23E+02 | 1.19E+02 | 4.36E+01 |
| Global warming (GWP100a) | kg $CO_2$ eq | 4.28E+02 | 5.12E+02 | 3.86E+02 | 4.70E+02 | 2.47E+01 | 0 | 0 | 0 | 8.25E+00 | 7.79E+00 | 1.55E+00 |
| Ozone layer depletion (ODP) | kg CFC-11 eq | 7.07E-05 | 7.78E-05 | 6.27E-05 | 6.98E-05 | 4.59E-06 | 0 | 0 | 0 | 1.53E-06 | 1.32E-06 | 5.05E-07 |
| Photochemical oxidation | kg $C_2H_4$ eq | 5.00E-02 | 5.81E-02 | 4.39E-02 | 5.20E-02 | 3.19E-03 | 0 | 0 | 0 | 1.06E-03 | 1.41E-03 | 4.67E-04 |
| Acidification | kg $SO_2$ eq | 9.73E-01 | 1.14E+00 | 8.11E-01 | 9.77E-01 | 7.86E-02 | 0 | 0 | 0 | 2.62E-02 | 4.60E-02 | 1.12E-02 |
| Eutrophication | kg $PO_4$ eq | 6.50E-01 | 8.07E-01 | 6.10E-01 | 7.67E-01 | 1.75E-02 | 0 | 0 | 0 | 5.83E-03 | 1.42E-02 | 2.39E-03 |

## Environmental impacts – Glazed tiles

| Impact category | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Abiotic depletion | kg Sb eq | 8.98E-04 | 1.30E-03 | 7.63E-04 | 1.17E-03 | 7.90E-05 | 0 | 0 | 0 | 2.63E-05 | 2.60E-05 | 3.49E-06 |
| Abiotic depletion (fossil fuels) | MJ | 6.17E+03 | 7.34E+03 | 5.52E+03 | 6.68E+03 | 3.69E+02 | 0 | 0 | 0 | 1.23E+02 | 1.19E+02 | 4.36E+01 |
| Global warming (GWP100a) | kg $CO_2$ eq | 4.29E+02 | 5.15E+02 | 3.87E+02 | 4.73E+02 | 2.47E+01 | 0 | 0 | 0 | 8.25E+00 | 7.79E+00 | 1.55E+00 |
| Ozone layer depletion (ODP) | kg CFC-11 eq | 7.09E-05 | 7.85E-05 | 6.29E-05 | 7.06E-05 | 4.59E-06 | 0 | 0 | 0 | 1.53E-06 | 1.32E-06 | 5.05E-07 |
| Photochemical oxidation | kg $C_2H_4$ eq | 5.02E-02 | 5.89E-02 | 4.41E-02 | 5.28E-02 | 3.19E-03 | 0 | 0 | 0 | 1.06E-03 | 1.41E-03 | 4.67E-04 |
| Acidification | kg $SO_2$ eq | 9.79E-01 | 1.16E+00 | 8.17E-01 | 9.96E-01 | 7.86E-02 | 0 | 0 | 0 | 2.62E-02 | 4.60E-02 | 1.12E-02 |
| Eutrophication | kg $PO_4$ eq | 6.52E-01 | 8.14E-01 | 6.12E-01 | 7.74E-01 | 1.75E-02 | 0 | 0 | 0 | 5.83E-03 | 1.42E-02 | 2.39E-03 |

## 4.2 Resource use

## Resource use – Unglazed tiles

| Parameter | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ, net calorific value | 1.97E+02 | 2.38E+02 | 1.83E+02 | 2.24E+02 | 5.45E+00 | 0 | 0 | 0 | 1.82E+00 | 6.42E+00 | 3.77E-01 |
| Use of renewable primary energy resources used as raw materials | MJ, net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ, net calorific value | 1.97E+02 | 2.38E+02 | 1.83E+02 | 2.24E+02 | 5.45E+00 | 0 | 0 | 0 | 1.82E+00 | 6.42E+00 | 3.77E-01 |
| Use of non- renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ, net calorific value | 7.41E+03 | 8.85E+03 | 6.69E+03 | 8.13E+03 | 4.00E+02 | 0 | 0 | 0 | 1.33E+02 | 1.41E+02 | 4.68E+01 |
| Use of non- renewable primary energy resources used as raw materials | MJ, net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Total use of non- renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ, net calorific value | 7.41E+03 | 8.85E+03 | 6.69E+03 | 8.13E+03 | 4.00E+02 | 0 | 0 | 0 | 1.33E+02 | 1.41E+02 | 4.68E+01 |
| Use of secondary material | kg | 0.00E+00 | 2.73E+00 | 0.00E+00 | 2.73E+00 | 0.00E+00 | 0 | 0 | 0 | 0.00E+00 | 0.00E+00 | 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 | 0 | 0 | 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 | 0 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Use of net fresh water | $m^3$ | 3.32E+01 | 4.35E+01 | 2.77E+01 | 3.79E+01 | 1.21E+00 | 0 | 0 | 0 | 4.02E-01 | 1.93E+00 | 1.99E+00 |

## Resource use – Engobe tiles

| Parameter | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ, net calorific value | 2.00E+02 | 2.40E+02 | 1.86E+02 | 2.26E+02 | 5.45E+00 | 0 | 0 | 0 | 1.82E+00 | 6.42E+00 | 3.77E-01 |
| Use of renewable primary energy resources used as raw materials | MJ, net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ, net calorific value | 2.00E+02 | 2.40E+02 | 1.86E+02 | 2.26E+02 | 5.45E+00 | 0 | 0 | 0 | 1.82E+00 | 6.42E+00 | 3.77E-01 |
| Use of non- renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ, net calorific value | 7.44E+03 | 8.87E+03 | 6.72E+03 | 8.15E+03 | 4.00E+02 | 0 | 0 | 0 | 1.33E+02 | 1.41E+02 | 4.68E+01 |
| Use of non- renewable primary energy resources used as raw materials | MJ, net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Total use of non- renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ, net calorific value | 7.44E+03 | 8.87E+03 | 6.72E+03 | 8.15E+03 | 4.00E+02 | 0 | 0 | 0 | 1.33E+02 | 1.41E+02 | 4.68E+01 |
| Use of secondary material | kg | 0.00E+00 | 2.73E+00 | 0.00E+00 | 2.73E+00 | 0.00E+00 | 0 | 0 | 0 | 0.00E+00 | 0.00E+00 | 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 | 0 | 0 | 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 | 0 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Use of net fresh water | $m^3$ | 3.50E+01 | 4.46E+01 | 2.95E+01 | 3.91E+01 | 1.21E+00 | 0 | 0 | 0 | 4.02E-01 | 1.93E+00 | 1.99E+00 |

## Resource use – Glazed tiles

| Parameter | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ, net calorific value | 2.01E+02 | 2.44E+02 | 1.87E+02 | 2.30E+02 | 5.45E+00 | 0 | 0 | 0 | 1.82E+00 | 6.42E+00 | 3.77E-01 |
| Use of renewable primary energy resources used as raw materials | MJ, net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ, net calorific value | 2.01E+02 | 2.44E+02 | 1.87E+02 | 2.30E+02 | 5.45E+00 | 0 | 0 | 0 | 1.82E+00 | 6.42E+00 | 3.77E-01 |
| Use of non- renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ, net calorific value | 7.45E+03 | 8.91E+03 | 6.73E+03 | 8.19E+03 | 4.00E+02 | 0 | 0 | 0 | 1.33E+02 | 1.41E+02 | 4.68E+01 |
| Use of non- renewable primary energy resources used as raw materials | MJ, net calorific value | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Total use of non- renewable primary energy resources (primary energy and primary energy resources used as raw materials) | MJ, net calorific value | 7.45E+03 | 8.91E+03 | 6.73E+03 | 8.19E+03 | 4.00E+02 | 0 | 0 | 0 | 1.33E+02 | 1.41E+02 | 4.68E+01 |
| Use of secondary material | kg | 0.00E+00 | 2.73E+00 | 0.00E+00 | 2.73E+00 | 0.00E+00 | 0 | 0 | 0 | 0.00E+00 | 0.00E+00 | 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 | 0 | 0 | 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 | 0 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Use of net fresh water | $m^3$ | 3.60E+01 | 4.79E+01 | 3.04E+01 | 4.24E+01 | 1.21E+00 | 0 | 0 | 0 | 4.02E-01 | 1.93E+00 | 1.99E+00 |

## 4.3 Other environmental information describing waste categories and output flows

### Waste categories – Unglazed tiles

| Parameter | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Hazardous waste | kg | 1.00E-02 | 1.16E-02 | 8.38E-03 | 9.97E-03 | 9.73E-04 | 0 | 0 | 0 | 3.24E-04 | 2.71E-04 | 6.63E-05 |
| Non-hazardous waste disposed | kg | 4.77E+02 | 4.76E+02 | 1.99E+01 | 1.84E+01 | 1.95E+01 | 6.06E+00 | 0 | 0 | 6.50E+00 | 1.25E+02 | 3.00E+02 |
| Radioactive waste disposed/ stored | kg | 1.39E-02 | 1.59E-02 | 9.30E-03 | 1.13E-02 | 2.56E-03 | 0 | 0 | 0 | 8.54E-04 | 8.91E-04 | 2.90E-04 |

### Output flows - Unglazed tiles

| Waste type | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Components for re-use | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Materials for recycling | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7.00E+02 | 0 |
| Materials for energy recovery | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Exported energy | MJ per energy carrier | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Waste categories – Engobe tiles

| Parameter | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Hazardous waste | kg | 1.01E-02 | 1.17E-02 | 8.45E-03 | 1.00E-02 | 9.73E-04 | 0 | 0 | 0 | 3.24E-04 | 2.71E-04 | 6.63E-05 |
| Non-hazardous waste disposed | kg | 4.77E+02 | 4.76E+02 | 2.04E+01 | 1.87E+01 | 1.95E+01 | 6.06E+00 | 0 | 0 | 6.50E+00 | 1.25E+02 | 3.00E+02 |
| Radioactive waste disposed/ stored | kg | 1.40E-02 | 1.59E-02 | 9.39E-03 | 1.13E-02 | 2.56E-03 | 0 | 0 | 0 | 8.54E-04 | 8.91E-04 | 2.90E-04 |

### Output flows - Engobe tiles

| Waste type | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Components for re-use | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Materials for recycling | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7.00E+02 | 0 |
| Materials for energy recovery | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Exported energy | MJ per energy carrier | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## Waste categories – Glazed tiles

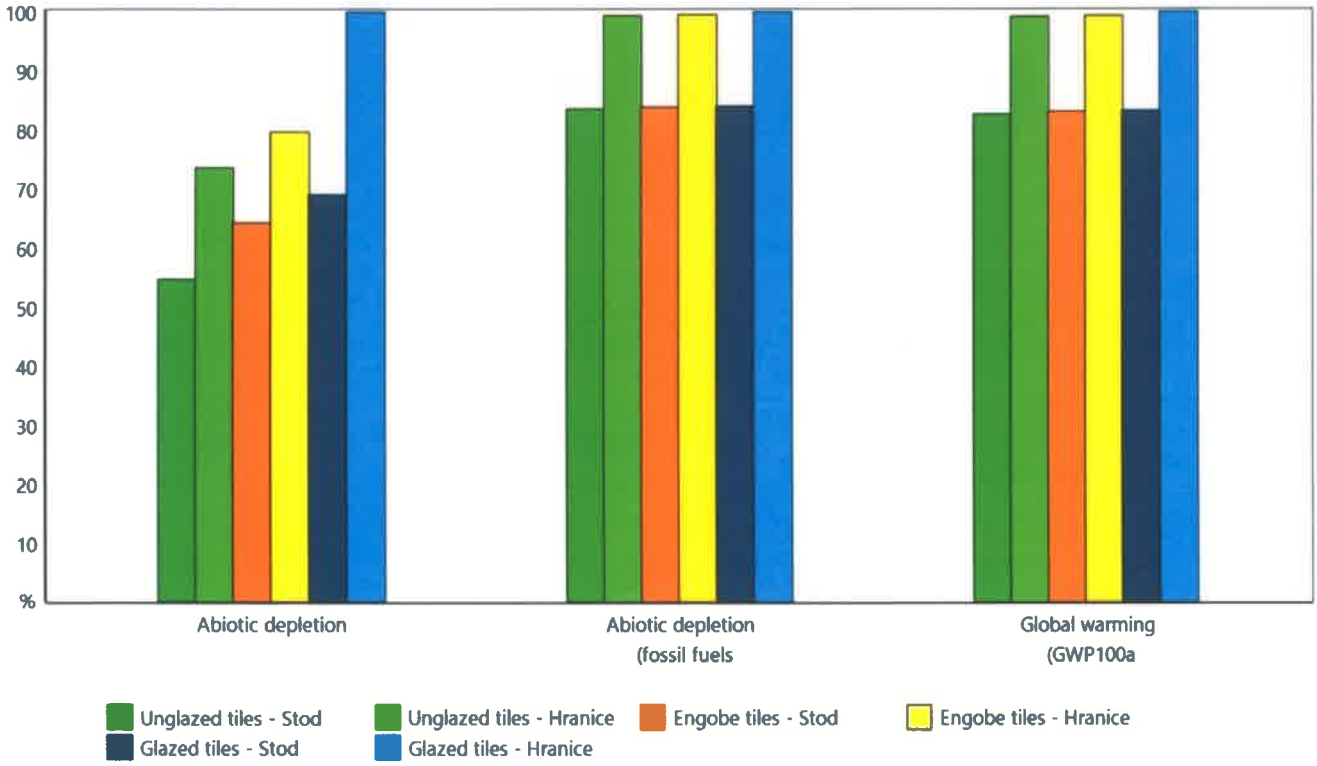
| Parameter | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Hazardous waste | kg | 1.01E-02 | 1.18E-02 | 8.48E-03 | 1.02E-02 | 9.73E-04 | 0 | 0 | 0 | 3.24E-04 | 2.71E-04 | 6.63E-05 |
| Non-hazardous waste disposed | kg | 4.78E+02 | 4.77E+02 | 2.06E+01 | 1.95E+01 | 1.95E+01 | 6.06E+00 | 0 | 0 | 6.50E+00 | 1.25E+02 | 3.00E+02 |
| Radioactive waste disposed/ stored | kg | 1.39E-02 | 1.61E-02 | 9.30E-03 | 1.15E-02 | 2.56E-03 | 0 | 0 | 0 | 8.54E-04 | 8.91E-04 | 2.90E-04 |

## Output flows – Glazed tiles

| Waste type | Unit | Total | | A1 - A3 | | A4 | A5 | B1 - B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stod | Hranice | Stod | Hranice | | | | | | | |
| Components for re-use | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Materials for recycling | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7.00E+02 | 0 |
| Materials for energy recovery | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Exported energy | MJ per energy carrier | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## 5. LCA: Interpretation

The following diagram represents results of the types of products (unglazed / engobe / glazed) from individual sites Stod and Hranice in the impact categories Abiotic depletion (minerals), Abiotic depletion (fossil fuels) and Global Warming (GWP 100a).




Method: EPD_15804+A1 V3.07 / EU25 / Characterization
Comparing product stages

The comparison shows that energy and fuel consumption in individual plants have an impact on the results rather than surface treatment of tiles. In the case of categories Abiotic depletion (fossil fuels) and Global warming, the surface treatment of the tiles has no impact.

## 6. References


1. EN 15804:2012+A1:2013 Sustainability of construction works – Environmental product declaration – Core rules of 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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