

Owner: Randers Tegl A/S
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3rd PARTY VERIFIED

EPD

VERIFIED ENVIRONMENTAL PRODUCT DECLARATION | ISO 14025 & EN 15804:2012
+ A1:2013



Owner of declaration

Randers Tegl A/S
 Mineralvej 4
 9100 Aalborg
 CVR: 20400234



Issued:
 21-12-2018

Valid to:
 21-12-2023

Programme operator

Danish Technological Institute
 Kongsvangs Allé 29
 8000 Aarhus



Basis of calculation

This Environmental Product Declaration is developed in accordance with ISO 14025 and EN 15804:2012 + A1:2013.

Programme

EPD Danmark
 Gregersensvej
 2630 Taastrup
 www.epddanmark.dk



Comparability

EPDs of construction products may not be comparable if they do not comply with the requirements in EN 15804:2012 + A1:2013. EPD data may not be comparable if the datasets used are not developed in accordance with EN 15804:2012 + A1:2013 and if the background systems are not based on the same database.

Validity

This EPD has been verified in accordance with ISO 14025 and is valid for 5 years from the date of issue.

Use

The intended use of an EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings.

Declared product

1 tonne of "yellow" bricks based on Danish yellow- and red-firing clay with and without an additional second firing under reducing conditions independent of the bricks format e.g. "RT Ultima 150".

EPD type

- Cradle-to-gate
- Cradle-to-gate with options
- Cradle-to-grave

Production site

Hammershøj Teglværk
 DK-8830 Tjele
 Denmark

Tiles & Bricks Europe (2014) PCR for Clay Construction Products – "Guidance document for developing an EPD" serves as the core PCR

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

- internal
- external

Third party verifier:

Kim Christiansen

Product use

Bricks such as "RT Ultima 150" and "RT 550 Unika" are used to build walls, pillars and partitions.

Functional unit

1 tonne of "yellow" bricks based on Danish yellow-, and red-firing clay with and without an additional second firing under reducing conditions and an expected average reference service life of 150 years.

Henrik Fred Larsen
 EPD Danmark

Life cycle stages and modules (MND = module not declared; MNR = module not relevant)

| Product | | | Construction process | | Use | | | | | | | | End of life | | | Beyond the system boundary |
|---------------------|-----------|---------------|----------------------|----------------------|-----|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-------------|------------------|----------|------------------------------------------|
| Raw material supply | Transport | Manufacturing | Transport | Installation process | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Re-use, recovery and recycling potential |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| X | X | X | X | X | MNR | MNR | MNR | MNR | MNR | MNR | MNR | MNR | X | X | X | X |

Product information

Product description

The product is a “yellow” brick based on Danish yellow-, and red-firing clay with and without an additional second firing under reducing conditions (referred to as yellow bricks in the following). The product components and packaging materials are shown in the tables below.

| Material | Weight-% of declared product |
|---------------------------|------------------------------|
| Danish yellow-firing clay | 48,5 |
| Danish red-firing clay | 34,5 |
| Sand | 8,3 |
| Bariumcarbonate | 0,7 |
| Colour | 0,1 |
| Manganese oxide | 0,2 |
| Water | 7,6 |
| TOTAL | 100 |

| Packaging | Weight-% of packaging |
|--------------|-----------------------|
| LDPE-film | 87 |
| Cardboard | 13 |
| TOTAL | 100 |

Representativeness

This declaration, including data collection, the modelled foreground system and the results, represents 1 tonne of bricks on the production site located in Hammershøj, Denmark. Product specific data are based on average values collected from 2016.

Background data are based on the GaBi database, supplemented with a few datasets from Ecoinvent. Generally, the used background datasets are of high quality and less than or 5 years old. All datasets are less than 10 years old.

Dangerous substances

Bricks do not contain substances listed in the “Candidate List of Substances of Very High Concern for authorisation” (<http://echa.europa.eu/candidate-list-table>)
Absence of these substances are declared by the producers.

Essential characteristics (CE)

Bricks are covered by the scope of any harmonized standard EN 771-1:2011+A1:2015. Furthermore, a DoP (Declaration of Performance) can be found at <http://www.randerstegl.dk/dop>

Further technical information can be obtained by contacting the manufacturer or on the manufacturers website:

<http://www.randerstegl.dk>

Reference Service Life (RSL)

150 years.

RSL is based on the PCR for clay construction products:

"For clay construction products, the RSL is 150 years. Studies have shown that clay construction products stand out with their high durability and prevail with no maintenance and a life span of 150 years or more".

LCA background

Declared unit

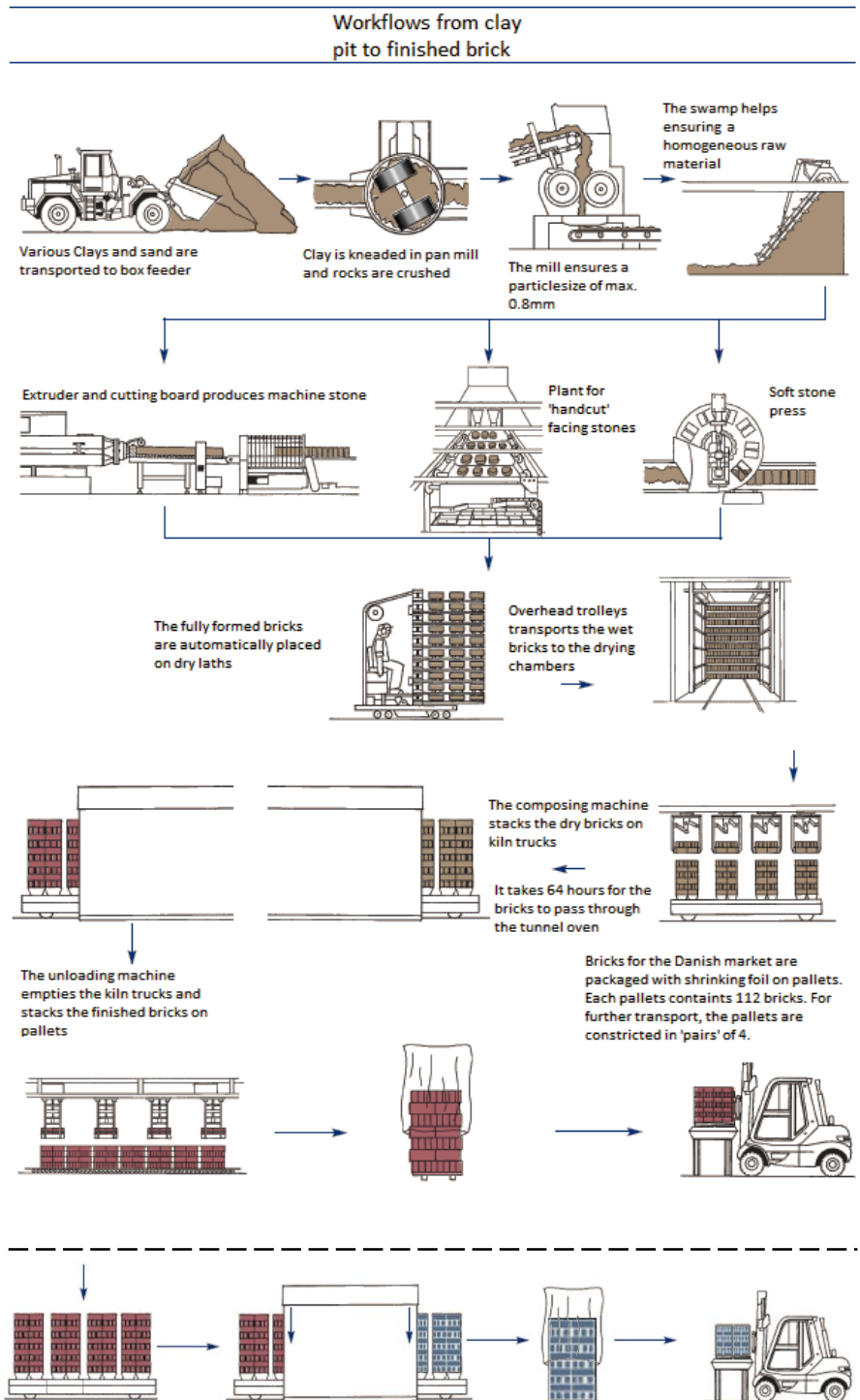
The LCI and LCIA results in this EPD relates to 1 tonne of bricks.

| Name | Value | Unit |
|----------------------------|-----------|-------------------|
| Declared unit | 1 | tonne |
| Density | 1600-2050 | kg/m ³ |
| Conversion factor to 1 kg. | 0.001 | - |

PCR

This EPD is developed according to the core rules for the product category of construction products in EN 15804:2012 + A1:2013 and the product specific PCR "TBE PCR for clay construction products".

Flow diagram



The flow diagram conforms with the requirements in the modular approach and shows the production phase A3. The remaining phases are described below.
 Below the dotted line the extra process involved with the second firing is shown.

System boundary

This EPD is based on a cradle-to-grave LCA (module A1-D), in which 100 weight-% has been accounted for. All relevant processes during the life cycle of the product has been accounted for and no life cycle stages has been omitted, in which significant environmental impacts are taking place. The use stage B1-B7 is assessed to be not relevant.

The general rules for the exclusion of inputs and outputs follows the requirements in EN 15804:2012 + A1:2013, 6.3.5, where the total of neglected input flows per module shall be a maximum of 5 % of energy usage and mass and 1 % of energy usage and mass for unit processes.

Key assumptions for the system boundary are described in each life cycle phase.

Product stage (A1-A3) includes:

- A1 – Extraction and processing of raw materials
- A2 – Transport to the production site
- A3 – Manufacturing processes

The product stage comprises the acquisition of all raw materials, products and energy, transport to the production site, packaging and waste processing up to the "end-of-waste" state or final disposal. The LCA results are declared in aggregated form for the product stage, which means, that the sub-modules A1, A2 and A3 are declared as one module A1-A3.

The second firing under reducing conditions are added in a separate column in the results section.

The bricks are packed on wooden pallets which are part of a return system, because of this the pallets are reused and are excluded from the calculations.

Construction process stage (A4-A5) includes:

The construction process stage includes:

- A4 – transport to the building site
- A5 – installation into the building

This includes the provision of all materials, products and energy, as well as waste processing up to the end-of-waste state or disposal of final residues during the construction process stage. These information modules also include all impacts and aspects related to any losses during this construction process stage. The loss is set equal to 3% in mass according to the PCR. The lost bricks are landfilled, and the packaging is incinerated with energy recovery and the credit is declared in module D.

Use stage (B1-B7) includes:

The use stage, related to the building fabric includes:

- B1 - use or application of the installed product
- B2 - maintenance
- B3 - repair
- B4 - replacement
- B5 – refurbishment

The use stage related to the operation of the building includes:

- B6 - operational energy use

B7 - operational water use

These information modules include provision and transport of all materials, products, as well as energy and water provisions, waste processing up to the end-of-waste state or disposal of final residues during this part of the use stage.

According to the PCR these modules do in general not generate relevant environmental impacts and are therefore neglected.

End-of-life stage (C1-C4 + D)

The end-of-life stage includes:

- C1 - de-construction, demolition
- C2 - transport to waste processing
- C3 - waste processing for reuse, recovery and/or recycling
- C4 - disposal

C1 can be ignored according to the PCR, whereas the rest of the modules are included using national scenarios. In C4 1% of the bricks are landfilled.

Module D includes the reuse, recovery and/or recycling potentials, expressed as net impacts and benefits. These included the energy produced in A5 (incineration of packaging) and substitution of gravel from the recycling of crushed bricks.

Cut-off criteria

The general rules for cut-offs of inputs and outputs in the EPD follows the rules in EN 15804:2012 + A1:2013 chapter 6.3.5. The maximum cut-off of input flows for a module is 5% for energy use and mass, while it is maximum 1% for unit processes.

LCA results

| ENVIRONMENTAL IMPACTS PER TONNE | | | | | | | | | | |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------|-----------|-----------|-------|-----------|----------|----------|-----------|
| Parameter | Unit | A1-A3 | Å1-A3 (second)* | A4 | A5 | B1-C1 | C2 | C3 | C4 | D |
| GWP | [kg CO ₂ -eq.] | 3,05E+02 | 4,89E+02 | 2,95E+00 | 2,35E+00 | - | 2,24E+00 | 7,00E-01 | 1,56E-01 | -2,91E+00 |
| ODP | [kg CFC11-eq.] | 7,14E-08 | 7,16E-08 | 9,90E-13 | 7,90E-13 | - | 7,53E-13 | 2,37E-13 | 1,58E-13 | -3,76E-11 |
| AP | [kg SO ₂ -eq.] | 8,02E-01 | 8,98E-01 | 1,24E-02 | 3,99E-03 | - | 9,39E-03 | 6,93E-03 | 9,26E-04 | -1,26E-02 |
| EP | [kg PO ₄ ³⁻ -eq.] | 7,76E-02 | 8,78E-02 | 3,08E-03 | 6,65E-04 | - | 2,34E-03 | 1,51E-03 | 1,26E-04 | -2,34E-03 |
| POCP | [kg ethene-eq.] | 4,07E-02 | 5,68E-02 | -4,53E-03 | -1,33E-04 | - | -3,45E-03 | 7,35E-04 | 7,28E-05 | -1,11E-03 |
| ADPE | [kg Sb-eq.] | 4,83E-04 | 5,03E-04 | 2,37E-07 | 2,03E-07 | - | 1,81E-07 | 5,67E-08 | 5,60E-08 | -8,16E-07 |
| ADPF | [MJ] | 3,34E+03 | 5,95E+03 | 4,08E+01 | 9,76E+00 | - | 3,10E+01 | 9,74E+00 | 2,02E+00 | -3,71E+01 |
| Caption | GWP = Global warming potential; ODP = Ozone depletion potential; AP = Acidification potential of soil and water; EP = Eutrophication potential; POCP = Photochemical ozone creation potential; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources *second firing under reducing conditions | | | | | | | | | |

| RESOURCE USE PER TONNE | | | | | | | | | | |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------|----------|----------|-------|----------|----------|----------|-----------|
| Parameter | Unit | A1-A3 | A1-A3 (second)* | A4 | A5 | B1-C1 | C2 | C3 | C4 | D |
| PERE | [MJ] | 2,44E+02 | 5,43E+02 | - | - | - | - | - | - | - |
| PERM | [MJ] | 1,11E+00 | 1,11E+00 | - | - | - | - | - | - | - |
| PERT | [MJ] | 2,57E+02 | 5,56E+02 | 2,05E+00 | 9,55E-01 | - | 1,56E+00 | 4,90E-01 | 2,44E-01 | -1,01E+01 |
| PENRE | [MJ] | 3,44E+03 | 6,11E+03 | - | - | - | - | - | - | - |
| PENRM | [MJ] | 2,08E+01 | 2,08E+01 | - | - | - | - | - | - | - |
| PENRT | [MJ] | 3,45E+03 | 6,12E+03 | 4,09E+01 | 1,00E+01 | - | 3,11E+01 | 9,77E+00 | 2,10E+00 | -4,34E+01 |
| SM | [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 |
| RSF | [MJ] | 1,07E+03 | 1,07E+03 | 0,00E+00 | 0,00E+00 | - | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| NRSF | [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 |
| FW | [m ³] | 4,94E+01 | 4,95E+01 | 3,80E-03 | 5,13E-03 | - | 2,89E-03 | 9,08E-04 | 3,99E-04 | -1,11E-02 |
| Caption | PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM = Use of non renewable primary energy resources used as raw materials; PENRT = Total use of non renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non renewable secondary fuels; FW = Use of net fresh water *second firing under reducing conditions | | | | | | | | | |

| WASTE CATEGORIES AND OUTPUT FLOWS PER TONNE | | | | | | | | | | |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------|----------|----------|-------|----------|----------|----------|-----------|
| Parameter | Unit | A1-A3 | A1-A3 (second)* | A4 | A5 | B1-C1 | C2 | C3 | C4 | D |
| HWD | [kg] | 3,41E-04 | 3,41E-04 | 2,15E-06 | 2,78E-07 | - | 1,63E-06 | 5,13E-07 | 3,31E-08 | -6,37E-07 |
| NHWD | [kg] | 6,46E+00 | 7,28E+00 | 3,13E-03 | 3,00E+01 | - | 2,38E-03 | 7,47E-04 | 9,71E+00 | -4,00E+01 |
| RWD | [kg] | 2,50E-02 | 5,04E-02 | 5,58E-05 | 1,07E-04 | - | 4,24E-05 | 1,33E-05 | 2,86E-05 | -2,51E-03 |
| CRU | [kg] | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 |
| MFR | [kg] | 0 | 0 | 0 | 0 | - | 0 | 9,60E+02 | 0 | 0 |
| MER | [kg] | 0 | 0 | 0 | 5,59E-01 | - | 0 | 0 | 0 | 0 |
| EEE | [MJ] | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 |
| EET | [MJ] | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 |
| Caption | HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy *second firing under reducing conditions | | | | | | | | | |

Additional information

Technical information on scenarios

Transport to the building site (A4)

| Parameter | Value | Unit |
|---------------------------------------------|--------------------------------------------------------|-------------------|
| Fuel type | Diesel | - |
| Truck type | Euro 4, 20 - 26t gross weight / 17,3t payload capacity | - |
| Transport distance | 50 | km |
| Capacity utilisation (including empty runs) | 85 | % |
| Gross density of transported product | 1200-2050 | kg/m ³ |
| Capacity utilisation, volume factor | 1 | - |

Installation of the product in the building (A5)

| Parameter | Value | Unit |
|-----------------------------------------|-------|------|
| Waste material (bricks) | 30 | kg |
| Waste material (packaging) | 0.56 | kg |
| Direct emissions to air, soil and waste | 0 | kg |

Use (B1-B7)

| Parameter | Value | Unit |
|--------------|-------|------|
| Not relevant | | |

Reference service life

| Parameter | Value |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Reference service life | 150 years |
| Declaration of performance (at gate) etc. | DoP |
| Instructions of use | DoP |
| Assumed quality of installation work according to producer guidelines | Supplier guidelines www.randerstegl.dk |
| Outdoor environment – weather, wind, pollution, UV etc. | www.randerstegl.dk/dop |
| Indoor environment – temperature, moisture etc. | http://bygitegl.dk/pdf/SBI_undersoegelsen.pdf |
| Use conditions – mechanical tear, use frequency etc. | www.randerstegl.dk/dop |
| Maintenance (frequency, type, quality, replacements etc.) | <i>Construction Clay Products, TBE 2014</i> |

End of life (C1-C4)

| Parameter | Value | Unit |
|------------------------------|-------|------|
| Separated construction waste | 970 | kg |
| Mixed construction waste | 0 | kg |
| For reuse | 0 | kg |
| For recycling | 960.3 | kg |
| For energy recovery | 0 | kg |
| For landfilling | 9.7 | Kg |

Reuse, recovery and/or recycling potential

| Parameter | Value | Unit |
|----------------|-------|------|
| PE | 0.49 | kg |
| Paper | 0.074 | kg |
| Crushed bricks | 960.3 | Kg |

Indoor air

The EPD does not give information on release of dangerous substances to indoor air because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not available.

Soil and water

The EPD does not give information on release of dangerous substances to soil and water because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not available.

References

| | |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Publisher |  http://www.epddanmark.dk |
| Programme operator | Danish Technological Institute Gregersensvej DK-2630 Taastrup http://www.teknologisk.dk |
| LCA-practitioner | Danish Technological Institute Gregersensvej DK-2630 Taastrup http://www.teknologisk.dk |
| LCA software /background data | GaBi ts, compilation 8.1.0.29 GaBi ts database, version 8.0.0.6 Ecoinvent, version 3.3. |
| 3rd party verifier | Kim Christiansen – kimconsult.dk |

General programme instructions

Version 1.9

www.epddanmark.dk

EN 15804:2012 + A1:2013

DS/EN 15804 + A1:2013 - "Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products"

EN 15942

DS/EN 15942:2011 – " Sustainability of construction works – Environmental product declarations – Communication format business-to-business"

ISO 14025

DS/EN ISO 14025:2010 – " Environmental labels and declarations – Type III environmental declarations – Principles and procedures"

ISO 14040

DS/EN ISO 14040:2008 – " Environmental management – Life cycle assessment – Principles and framework"

ISO 14044

DS/EN ISO 14044:2008 – " Environmental management – Life cycle assessment – Requirements and guidelines"

Tiles & Bricks Europe

TBE PCR for clay construction products (2014) Guidance document for developing and EPD

| Key environmental indicators | Unit | A1-A3 | A1-A3** | Transport *** |
|------------------------------|--------------------------|----------|----------|------------------|
| Global warming | kg CO ₂ -eqv. | 3,05E+02 | 4,89E+02 | 5,0 |
| Energy use | MJ | 3,45E+03 | 6,12E+03 | 62 |
| Dangerous substances | * | - | - | - |

* The product contains no substances from the REACH Candidate list or the Norwegian priority list.

** Second firing under reducing conditions.

*** Transport from production site to central warehouse in Norway.

Additional Norwegian requirements

Electricity

Electricity used in the manufacturing processes has been accounted for using the process:

Danish electricity grid mix at consumer (1-60 kV) from GaBi 8.1

Greenhouse gas emissions: 0.115 kg CO₂-eqv/MJ

Dangerous substances

None of the following substances have been added to the product: Substances on the REACH Candidate list of substances of very high concern (November 2017) substances on the Norwegian Priority list (November 2017) and substances that lead to the product being classified as hazardous waste. The chemical content of the product complies with regulatory levels as given in the Norwegian Product Regulations.

Transport

Transport from production site to central warehouse in Norway: 350 km

Indoor environment

Not relevant

Carbon footprint

Carbon footprint has not been worked out for the product.