

Owner: Randers Tegl A/S
No.: MD-22028-EN_rev1
Issued first time: 19-10-2022
Issued: 18-11-2022
Valid to: 19-10-2027

3rd PARTY VERIFIED

EPD

VERIFIED ENVIRONMENTAL PRODUCT DECLARATION | ISO 14025 & EN 15804



Owner of declaration

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



Issued:
 18-11-2022

Valid to:
 19-10-2027

Programme

EPD Danmark
www.epddanmark.dk



Declared products

1 tonne of tiles based on a clay mix of Danish clay, German clay and secondary clay, e.g. RT 806 (red), RT 811 (Yellow), RT 807 (brown), RT 840 (Engobed) and RT 810 (damped).

Number of declared datasets/product variations: 5

Production site

Højslev Teglværk
 7840, Højslev
 Denmark

The product is produced using certified green electricity and natural gas.

Product(s) use

Roof tiles are used as outer, protective layer in roof constructions.

Declared/functional unit

1 ton

Year of production site data (A3)

2020

EPD version

Second version.
 Calculation mistake corrected.

Basis of calculation

This EPD is developed in accordance with the European standard EN 15804+A1.

Comparability

EPDs of construction products may not be comparable if they do not comply with the requirements in EN 15804. EPD data may not be comparable if the datasets used are not developed in accordance with EN 15804 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.

EPD type

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

CEN standard EN 15804 serves as the core PCR
Independent verification of the declaration and data, according to EN ISO 14025
<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Third party verifier: Ninkie Bendtsen

Martha Katrine Sørensen
 EPD Danmark

Life cycle stages and modules (MND = module not declared)																
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	X	X	X	X	X	X	X	X	X	X	X	X

Product information

Product description:

This EPD covers roofing tiles of different formats produced at Højslev Teglværk.

Five products are declared: Red tiles, yellow tiles, brown tiles, engobed tiles and blue damped tiles. The tiles are based on a clay mix of red and blue Danish clay, German clay and secondary clay. Produced using green electricity and natural gas. The product components and packaging materials are shown in the tables below.

Material	Weight-% of red tile	Weight-% of yellow tile	Weight-% of brown tile	Weight-% of engobed tile	Weight-% of damped tile
Danish blue clay	20	19	20	20	20
Danish red clay	48	45	48	48	49
German shale	11	10	10	10	11
Secondary clay	17	15	16	17	17
Chamotte	1	1	1	1	1
Barium carbonate	1	1	1	1	1
Additive*	0	8 ^b	2 ^a	1 ^c	0
Vand	<2	<2	<2	<2	<2
TOTAL	100	100	100	100	100

*(Manganese oxide^a, titaniumdioxide^b or engobe^c)

Packaging	Weight-% of packaging
LDPE-film	36
Plastic strap (PET)	15
Cardboard	49
TOTAL	100

Representativity

This declaration, including data collection, the modelled foreground system and the results, represents 1 tonne of roof tiles on the production site located in Højslev, Denmark. Product specific data are based on average values collected from 2020.

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.

Hazardous substances

Rooftiles from Højslev Teglværk does not contain substances listed on the "Candidate List of Substances of Very High Concern for authorisation" (<http://echa.europa.eu/candidate-list-table>)

Essential characteristics

Tiles are covered by the scope of the harmonized standard DS/EN 1304:2013. Furthermore, a DoP (Declaration of Performance) can be obtained via <https://www.randerstegl.com/>

Further technical information can be obtained by contacting the manufacturer or on the manufacturers website: <https://www.randerstegl.com/>

Reference Service Life (RSL)

150 years.

RSL is based on the cPCR 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".

Product illustrations:

The illustrated products below are examples of products covered by this EPD.



RT 806 (red tile)



RT 811 (Yellow tile)



RT 807 (Brown tile)



RT 840 (Engobed tile)



RT 810 (Damped tile)

Links to product examples:

<https://www.randerstegl.com/en/roof-tiles/product/rt806-hoejslev-lille-dansk-format>

<https://www.randerstegl.com/en/roof-tiles/product/rt811-hoejslev-lille-dansk-format>

<https://www.randerstegl.com/en/roof-tiles/product/rt807-hoejslev-lille-dansk-format>

<https://www.randerstegl.com/en/roof-tiles/product/rt840-hoejslev-lille-dansk-format>

<https://www.randerstegl.com/en/roof-tiles/product/rt810-hoejslev-lille-dansk-format>

LCA background

Declared unit

The LCI and LCIA results in this EPD relates to 1 ton of roof tiles.

Name	Value	Unit
Declared unit	1	ton
Density	31,5 – 52,5	kg/m ² *
Conversion factor to 1 kg.	0,001	-

*Varies depending on the type of tile and roof.

Functional unit

Not defined.

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" (cPCR).

Guarantee of Origin – certificates

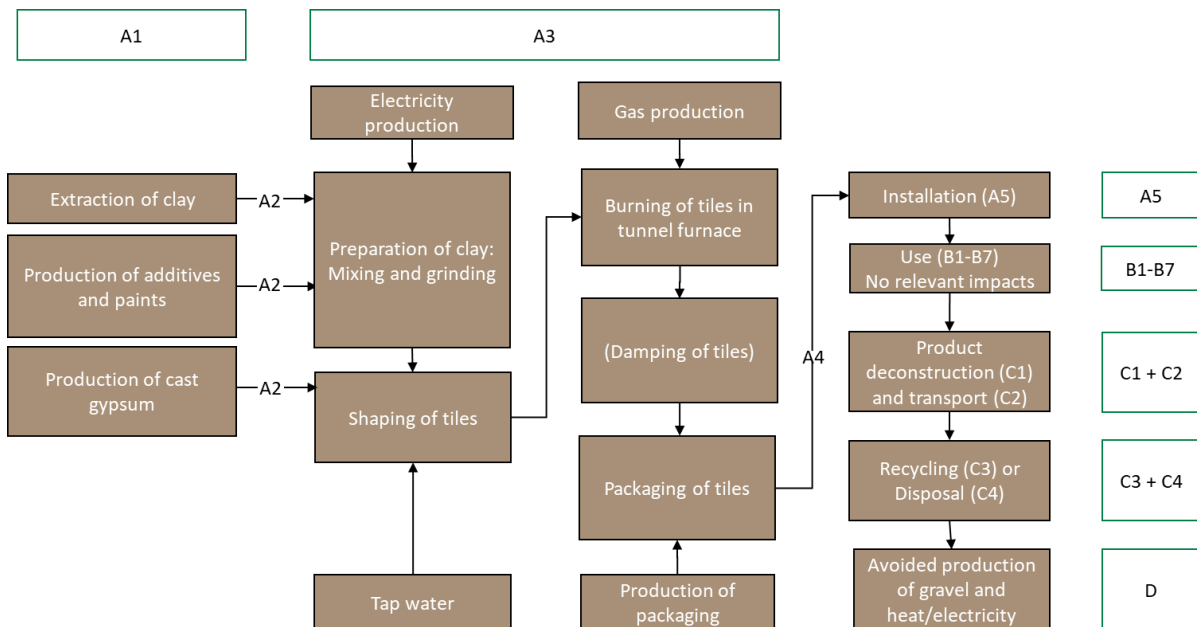
Foreground system:

The product is produced using certified electricity from windmills in the production.

Background system:

Upstream and downstream processes are modelled using Danish grid mix data where possible, and default data from datasets in all other processes, where energy source cannot be defined.

Flowdiagram



This flow diagram illustrates the life cycle of the tiles. Damping of tiles is only relevant for damped tiles.

System boundary

This EPD is based on a cradle-to-grave LCA, in which 100 weight-% has been accounted for.

The general rules for the exclusion of inputs and outputs follows the requirements in EN 15804, 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.

The modules A4-D are based on Danish scenarios.

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 tiles 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. The use of mortar is excluded according to the cPCR. These information modules also include all impacts and aspects related to any losses during this construction process stage. The loss of tiles is set equal to 2% in mass according to the cPCR. The lost tiles 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 cPCR these modules do in general not generate relevant environmental impacts and are therefore neglected.

End-of-life stage (C1-C4)

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 cPCR, whereas the rest of the modules are included using national scenarios. In C4 1% of the bricks are landfilled.

Re-use, recovery and recycling potential (D) includes:

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 tiles.

LCA results

ENVIRONMENTAL IMPACTS FROM MODULE A1-A3 PER TON OF TILES						
Parameter	Unit	Red tiles (A1-A3)	Yellow tiles (A1-A3)	Brown tiles (A1-A3)	Engobed tiles (A1-A3)	Damped tiles (A1-A3)
GWP	[kg CO ₂ -eq.]	2,81E+02	4,69E+02	3,15E+02	2,88E+02	4,43E+02
ODP	[kg CFC11-eq.]	2,11E-06	1,73E-05	4,96E-06	2,25E-06	2,30E-06
AP	[kg SO ₂ -eq.]	3,84E+00	5,08E+00	3,98E+00	3,87E+00	3,92E+00
EP	[kg PO ₄ ³⁻ -eq.]	3,22E-01	1,17E+00	3,98E-01	3,30E-01	3,40E-01
POCP	[kg ethene-eq.]	2,02E-01	2,78E-01	2,10E-01	2,05E-01	2,13E-01
ADPE	[kg Sb-eq.]	4,01E-04	2,34E-03	5,45E-04	4,17E-04	4,51E-04
ADPF	[MJ]	4,50E+03	7,19E+03	4,85E+03	4,56E+03	7,20E+03
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					
	The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 ² or 195, while 1,12E-11 is the same as 1,12*10 ⁻¹¹ or 0,0000000000112.					

ENVIRONMENTAL IMPACTS FROM A4-D PER TON OF TILES									
Parameter	Unit	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP	[kg CO ₂ -eq.]	3,24E+00	7,56E+00	0,00E+00	0,00E+00	2,49E+00	7,13E-01	1,41E-01	-4,42E+00
ODP	[kg CFC11-eq.]	2,32E-13	5,46E-13	0,00E+00	0,00E+00	1,79E-13	5,15E-14	7,69E-16	-3,40E-11
AP	[kg SO ₂ -eq.]	2,36E-03	3,22E-03	0,00E+00	0,00E+00	1,82E-03	2,13E-03	8,42E-04	-9,33E-03
EP	[kg PO ₄ ³⁻ -eq.]	4,74E-04	5,41E-04	0,00E+00	0,00E+00	3,64E-04	4,99E-04	9,55E-05	-1,69E-03
POCP	[kg ethene-eq.]	-3,04E-05	-9,27E-05	0,00E+00	0,00E+00	-2,34E-05	2,23E-04	6,46E-05	-8,78E-04
ADPE	[kg Sb-eq.]	2,76E-07	6,35E-08	0,00E+00	0,00E+00	2,12E-07	6,11E-08	1,41E-08	-8,98E-07
ADPF	[MJ]	4,37E+01	8,63E+00	0,00E+00	0,00E+00	3,36E+01	9,67E+00	1,91E+00	-5,90E+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								
	The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 ² or 195, while 1,12E-11 is the same as 1,12*10 ⁻¹¹ or 0,0000000000112.								

RESOURCE USE IN A1-A3 PER TON OF TILES						
Parameter	Unit	Red tiles (A1-A3)	Yellow tiles (A1-A3)	Brown tiles (A1-A3)	Engobed tiles (A1-A3)	Damped tiles (A1-A3)
PERE	[MJ]	1,06E+03	1,16E+03	1,12E+03	1,07E+03	1,08E+03
PERM	[MJ]	2,25E+01	2,25E+01	2,25E+01	2,25E+01	2,25E+01
PERT	[MJ]	1,08E+03	1,18E+03	1,14E+03	1,09E+03	1,11E+03
PENRE	[MJ]	4,53E+03	7,31E+03	5,05E+03	4,60E+03	7,25E+03
PENRM	[MJ]	5,74E+01	5,74E+01	5,74E+01	5,74E+01	5,74E+01
PENRT	[MJ]	4,59E+03	7,36E+03	5,11E+03	4,65E+03	7,30E+03
SM	[kg]	2,49E+02	2,49E+02	2,49E+02	2,49E+02	2,49E+02
RSF	[MJ]	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
FW	[m ³]	8,95E-01	4,98E+00	1,77E+00	9,16E-01	9,26E-01
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					
	The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 ² or 195, while 1,12E-11 is the same as 1,12*10 ⁻¹¹ or 0,0000000000112.					

RESOURCE USE IN A4-D PER TON OF TILES									
Parameter	Unit	A4	A5	B1-B7	C1	C2	C3	C4	D
PERE	[MJ]	2,50E+00	1,03E+00	0,00E+00	0,00E+00	1,92E+00	5,54E-01	2,65E-01	-3,43E+01
PERM	[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
PERT	[MJ]	2,50E+00	1,03E+00	0,00E+00	0,00E+00	1,92E+00	5,54E-01	2,65E-01	-3,43E+01
PENRE	[MJ]	4,41E+01	8,97E+00	0,00E+00	0,00E+00	3,39E+01	9,77E+00	1,97E+00	-6,69E+01
PENRM	[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
PENRT	[MJ]	4,41E+01	8,97E+00	0,00E+00	0,00E+00	3,39E+01	9,77E+00	1,97E+00	-6,69E+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]	0,00E+00	0,00E+00	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	[m³]	2,83E-03	1,80E-02	0,00E+00	0,00E+00	2,17E-03	6,27E-04	4,86E-04	-1,82E-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 The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 ² or 195, while 1,12E-11 is the same as 1,12*10 ⁻¹¹ or 0,0000000000112.								

WASTE CATEGORIES AND OUTPUT FLOWS PER TON OF TILES						
Parameter	Unit	Red tiles (A1-A3)	Yellow tiles (A1-A3)	Brown tiles (A1-A3)	Engobed tiles (A1-A3)	Damped tiles (A1-A3)
HWD	[kg]	6,41E-07	6,42E-07	6,41E-07	6,42E-07	8,37E-07
NHWD	[kg]	7,47E-01	7,61E-01	7,46E-01	7,50E-01	1,18E+00
RWD	[kg]	1,93E-03	2,03E-03	1,91E-03	2,11E-03	4,13E-03
CRU	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	1,11E+01	1,11E+01	1,11E+01	1,11E+01	1,11E+01
MER	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
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 The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 ² or 195, while 1,12E-11 is the same as 1,12*10 ⁻¹¹ or 0,0000000000112.					

WASTE CATEGORIES AND OUTPUT FLOWS PER TON OF TILES									
Parameter	Unit	A4	A5	B1-B7	C1	C2	C3	C4	D
HWD	[kg]	2,11E-10	5,63E-10	0,00E+00	0,00E+00	1,62E-10	4,68E-11	2,09E-10	-6,26E-09
NHWD	[kg]	6,32E-03	2,02E+01	0,00E+00	0,00E+00	4,86E-03	1,40E-03	9,83E+00	-4,06E+01
RWD	[kg]	5,44E-05	1,16E-04	0,00E+00	0,00E+00	4,18E-05	1,20E-05	2,07E-05	-3,06E-03
CRU	[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
MFR	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,72E+02	0,00E+00	0,00E+00
MER	[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
EEE	[MJ]	0,00E+00	1,36E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	0,00E+00	2,43E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
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 The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 ² or 195, while 1,12E-11 is the same as 1,12*10 ⁻¹¹ or 0,0000000000112.								

Additional information

LCA interpretation

The environmental impact from production of clay tiles mostly originates from the use of natural gas in the oven, both production of gas as well as the direct emissions from the oven. The production of additives such as barium carbonate, manganese oxide and titanium oxide is also of high importance, especially for the yellow tile, where the addition of titanium oxide is giving significantly larger impacts in all impact categories.

Technical information on scenarios

Transport to the building site (A4)

Parameter	Value	Unit
Fuel type	Diesel (0,018 L/tkm)	-
Truck type	Euro 6 more than 32t gross weight / 24,7 t payload capacity	-
Transport distance	50	km
Capacity utilisation (including empty runs)	61	%
Gross density of transported product	616-1006	kg/m ³
Capacity utilisation, volume factor	1	-

Installation of the product in the building (A5)

Parameter	Value	Unit
Waste material (tiles)	20	kg
Waste material (packaging)	3,05	kg
Direct emissions to air, soil and waste	0	kg

Reference service life

RSL information	
Reference service Life	150 years
Declared product properties	www.randerstegl.dk/dop
Design application parameters	https://www.mur-tag.dk/fileadmin/user_upload/Editor/pdf/pjecer/Tegl_36_-_marts_2021.pdf
Assumed quality of work	Supplier guidelines https://www.randerstegl.com/
Outdoor environment	www.randerstegl.dk/dop
Indoor environment	https://www.mur-tag.dk/fileadmin/user_upload/Editor/pdf/pjecer/Tegl_36_-_marts_2021.pdf
Usage conditions	www.randerstegl.dk/dop
Maintenance	Construction Clay Products, TBE 2014

Use (B1-B7)

Scenario information	Value	Unit
Not relevant	-	-

End of life (C1-C4)

Parameter	Value	Unit
Separated construction waste	982	kg
Mixed construction waste	0	kg
For reuse	972	kg
For recycling	0	kg
For energy recovery	0	kg
For landfilling	9,8	Kg

Re-use, recovery and recycling potential (D)

Scenario information/Materiel	Value	Unit
PE	1,1	kg
PET	0,46	kg
Cardboard	1,5	kg
Crushed tiles	972	kg


Indoor air

The EPD does not give information on release of dangerous substances to indoor air because the horizontal standards on the relevant measurements are not available. Read more in EN15804+A1 chapter 7.4.1.

Soil and water

The EPD does not give information on release of dangerous substances to soil and water because the horizontal standards on the relevant measurements are not available. Read more in EN15804+A1 chapter 7.4.2.

References

Publisher	 http://www.epddanmark.dk
Programme operator	Danish Technological Institute Buildings & Environment 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, version 10.6 GaBi database, version 2022.1 Ecoinvent, version 3.5 and 3.8
3rd party verifier	Ninkie Bendtsen NIRAS A/S Sortemosevej 19 DK-3450 Allerød www.niras.dk

General programme instructions

General Programme Instructions, version 2.0, spring 2020
www.epddanmark.dk

EN 15804

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

Tiles & Bricks Europe

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

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"