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3rd PARTY VERIFIED

EPD

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



Owner of declaration

Petersen Tegl A/S
 Nybølnervej 14
 DK-6310 Broager
 CVR: 28672012



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Programme operator

Danish Technological Institute
 Gregersensvej
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Programme

EPD Danmark
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Basis of calculation

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

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.

EPD type

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

Declared product

Two clay product types declared: 1 tonne of D-bricks (coal-fired) and one ton of Kolumba and Cover (gas fired in periodic kilns). Weighted average among four colour shades used for each type (Average product, company level)

Production sites

Petersen Tegl A/S
 DK-6310 Broager
 Denmark

Product use

The clay products D-bricks and Kolumba are used in unprotected masonry and the clay product Cover is used for roof covering, external wall cladding or internal wall lining.

Functional unit

1 tonne of the clay products D-bricks, Kolumba or Cover is based on yellow-firing and red-firing clay, German clay and British clay and with an expected average reference service life of 150 years.

Year of production site data (A3)

2017. For the prolongation it has been shown that there are no significant changes between production data of 2017 and 2022.

EPD version

Second version. The EPD has been extended 5 years after re-verification.

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

Kim Christiansen

Martha Katrine Sørensen

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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 two clay product types, i.e. D-bricks, and Kolumba and Cover, are both based on yellow-firing and red-firing clay, German and British clay. D-bricks are burned in tunnel kiln, and Kolumba and Cover in periodic kilns. The product components and packaging materials are shown in the tables below.

Material	Weight-% of declared product
Yellow-firing clay	0-43
Red-firing clay	24-75
German/British clay	0-24
Sand	13-30
Chalk	0-1
Barium carbonate/barium chloride	0-1
Manganese oxide/manganese chloride	0-1
Water	0-5
TOTAL	100

Packaging	Weight-% of packaging
LDPE-film	73
Plastic strap (PET)	17
Cardboard	10
TOTAL	100

Representativeness

This declaration, including data collection, the modelled foreground system and the results, represents 1 tonne of clay products from the production sites located in Broager, Denmark. Product specific data are based on average values collected from 2017.

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 5 years old. All datasets are less than 10 years old.

Dangerous substances

The clay products 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 producer.

Essential characteristics (CE)

The clay products are covered by the scope of any harmonized standard EN 771-1:2011+A1:2015 or DIN EN 1304:2008-07. Furthermore, DoP's (Declaration of Performance) can be found at <https://en.petersen-tegl.dk/>

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

<https://en.petersen-tegl.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".

Product illustrations:

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

D-bricks



Kolumba



Cover



LCA background

Declared unit

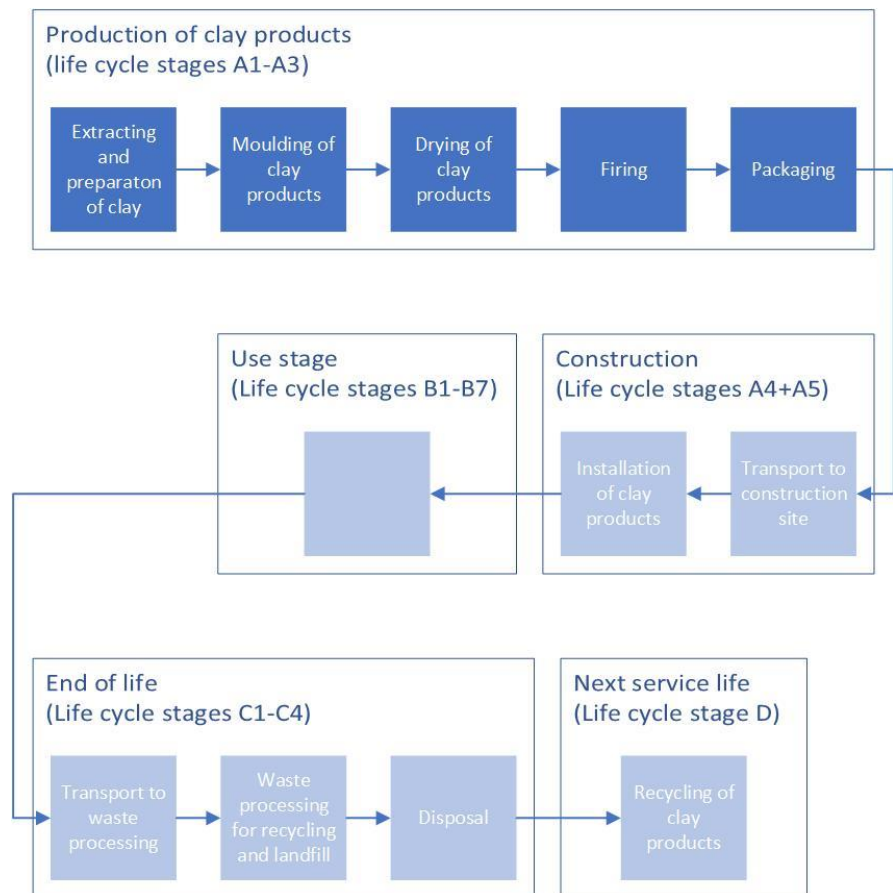
The LCI and LCIA results in this EPD relates to 1 tonne of clay products.

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 different stages.

The stages are described in more details below.

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 two products types D-bricks (coal fired) and Kolumba/Cover (gas fired in periodic kilns) are shown in two separate columns in the results section.

Production at Petersen Tegl (A3):

Extracting and preparing the clay:

All Petersen products are made of natural raw materials – clay mixed with sand and other natural earth minerals. Nothing goes to waste. If the finished item does not meet quality standards, it is crushed and recycled into new clay products. Petersen sources most of its clay from quarries within a few miles of the company's production plants in Broager, Southern Jutland. It stores the clay and sand at the brickworks before moving them to the box feeder inside the production plant. The raw materials are then crushed and ground to achieve the right particle size, consistency and homogeneity. Techniques that imitate old hand-made production methods then form and press the mixture. This provides the best possible texture. It also adds capillaries and pores that will allow water to expand when it freezes without ruining the clay product.

Moulding:

Petersen Tegl uses its own technology to produce coal-fired clay products (the D-line, where D-bricks are produced). The system moulds "hand-made" clay products in a way that endows them with very varied characteristics even in the same batch. Petersen specializes in the maximum variation of colour and shape in its products. Kolumba™ and the Petersen Cover™ are completely handmade, using centuries-old craft technology and traditions. Skilled workers form the clay in special moulds, compress it and wipe off any surplus material.

Drying:

The clay products are then kept in drying chambers for several days.

Firing:

Petersen Tegl is the only brickworks in Denmark to produce coal fired clay products (the D-line) by injecting granulated pet coke into the kiln. It is a demanding process but it results in the many different shades of colour on Petersen clay products. Kolumba™ and Petersen Cover™ are gas fired in periodic kilns. Different firing temperatures and production conditions result in different textures and various shades of colour. This unique production method also results in the irregular structure and surface of the finished products.

Packaging:

All Petersen products are subjected to strict quality control prior to packing and shipping. Sometimes clay products from different batches, made of different mixtures of clay and fired differently are being mixed in together. This part of process guarantees colour consistency from pallet to pallet and that each shipment to a building site consists of a unique mix of colours. This "consistent inconsistency" prevents any single shade from dominating the look of the new building. The products 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.

Clay products can last for centuries. They do not need maintenance, replacement or surface treatment. The lifespan of a building material is crucial to its environmental impact. The longer a product lasts, the less impact it will have on the environment as defined in module B of EN 15804.

After demolition, clay products can be recycled or used as aggregate in other construction materials. In Denmark, more than 95% of clay products are recycled and not sent to landfill.

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: D-bricks	A1-A3: Kolumba/Cover	A4	A5	B1-C1	C2	C3	C4	D
GWP	[kg CO ₂ -eq.]	3,03E+02	5,33E+02	4,18E+00	3,02E+00	-	3,18E+00	6,97E-01	1,44E-01	-2,87E+00
ODP	[kg CFC11-eq.]	1,01E-06	1,01E-06	6,98E-16	2,87E-15	-	5,30E-16	1,17E-16	8,39E-16	-3,64E-14
AP	[kg SO ₂ -eq.]	2,88E+00	2,93E+00	1,74E-02	4,26E-03	-	1,32E-02	6,91E-03	8,65E-04	-1,22E-02
EP	[kg PO ₄ ³⁻ -eq.]	1,61E-01	1,56E-01	4,40E-03	6,96E-04	-	3,34E-03	1,52E-03	9,81E-05	-2,24E-03
POCP	[kg ethene-eq.]	1,03E-01	1,13E-01	-6,43E-03	-3,04E-04	-	-4,89E-03	7,39E-04	6,64E-05	-1,09E-03
ADPE	[kg Sb-eq.]	2,77E-04	2,77E-04	3,25E-07	2,05E-07	-	2,47E-07	5,48E-08	5,31E-08	-7,43E-07
ADPF	[MJ]	3,12E+03	7,64E+03	5,72E+01	1,12E+01	-	4,35E+01	9,64E+00	2,02E+00	-3,78E+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									

RESOURCE USE PER TONNE										
Parameter	Unit	A1-A3: D-bricks	A1-A3: Kolumba/Cover	A4	A5	B1-C1	C2	C3	C4	D
PERE	[MJ]	3,52E+02	6,04E+02	-	-	-	-	-	-	-
PERM	[MJ]	1,18E+00	1,18E+00	-	-	-	-	-	-	-
PERT	[MJ]	3,53E+02	6,05E+02	3,33E+00	1,14E+00	-	2,53E+00	5,61E-01	2,65E-01	-1,47E+01
PENRE	[MJ]	3,16E+03	7,71E+03	-	-	-	-	-	-	-
PENRM	[MJ]	2,72E+01	2,72E+01	-	-	-	-	-	-	-
PENRT	[MJ]	3,18E+03	7,73E+03	5,74E+01	1,15E+01	-	4,37E+01	9,67E+00	2,09E+00	-4,44E+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]	1,70E+02	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	[m ³]	1,11E+00	1,23E+00	5,63E-03	7,00E-03	-	4,28E-03	9,49E-04	5,27E-04	-1,33E-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									

WASTE CATEGORIES AND OUTPUT FLOWS PER TONNE										
Parameter	Unit	A1-A3: D-bricks	A1-A3: Kolumba/Cover	A4	A5	B1-C1	C2	C3	C4	D
HWD	[kg]	1,72E-05	1,64E-05	3,21E-06	3,73E-07	-	2,44E-06	5,40E-07	3,56E-08	-6,73E-07
NHWD	[kg]	1,09E+01	1,15E+01	4,67E-03	3,01E+01	-	3,55E-03	7,86E-04	9,71E+00	-4,00E+01
RWD	[kg]	2,00E-02	3,05E-02	7,79E-05	1,12E-04	-	5,93E-05	1,31E-05	2,80E-05	-2,66E-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	7,56E-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									

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)	55	%
Gross density of transported product	1600-2050	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)	0,75	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 https://en.petersen-tegl.dk/
Outdoor environment – weather, wind, pollution, UV etc.	https://en.petersen-tegl.dk/
Indoor environment – temperature, moisture etc.	https://sbi.dk/Assets/Muret-byggeri-og-indeklima_1/Muret-byggeri-og-indeklima.pdf
Use conditions – mechanical tear, use frequency etc.	https://en.petersen-tegl.dk/
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	0,55	kg
PET	0,13	kg
Paper	0,078	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 9.1 GaBi ts database, version 8.7 Ecoinvent, version 3.5.
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 an EPD