epddanmark

ECO PLATFORM EPD VERIFIED

Owner: H+H Deutschland GmbH
No.: MD-23057-EN
Issued: 28-04-2023
Valid to: 28-04-2028

3rd PARTY **VERIFIED**

EPD

VERIFIED ENVIRONMENTAL PRODUCT DECLARATION | **ISO 14025 & EN 15804**

Owner of declaration
H+H Deutschland GmbH
Industriestrasse 3
DE-23829 Wittenborn
VAT: 13427089

Programme
EPD Danmark
www.epddanmark.dk

☐ Industry EPD
☒ Product EPD

Declared product(s)
The EPD covers an autoclaved aerated concrete walls with a dry density of 575 kg/m^3

Number of declared datasets/product variations: 1

Production site
H+H production site in Germany
Address: Industriestrasse 3, DE-23829 Wittenborn, Germany

Product(s) use
H+H produce autoclaved aerated concrete (AAC) and sand-lime products and solutions primarily for walls in residential, industrial, and commercial construction.

Declared/ functional unit
1 m^3 of installed autoclaved aerated concrete wall

Year of production site data (A3)
2021

Issued: 28-04-2023
Valid to: 28-04-2028

Basis of calculation
This EPD is developed in accordance with the European standard EN 15804+A2.

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 with modules C1-C4 and D
☐Cradle-to-gate with options, modules C1-C4 and D
☒Cradle-to-grave and module D
☐Cradle-to-gate
☐Cradle-to-gate with options

CEN standard EN 15804 serves as the core PCR

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

☐ internal ☒ 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

The main product components are shown in the table below.

Material	Weight-% of declared product
Anhydrite	2%
Aluminum paste	0.06%
Cement	12%
Corrosion protection	0.02%
Lime	9%
Mould oil	0,04%
Recycled AAC	2%
Reinforcement steel	2%
Sand	44%
Water	29%
Sum	100%

Product packaging:

The composition of the sales- and transport packaging of the product is shown in the table below.

Material	Weight-% of packaging
Foil	4,6%
Plastic stripes	2,4%
Corner protection	0,9%
Pallet	92,1%

Representativity

This declaration, including data collection and the modeled foreground system including results, represents the production of the autoclaved aerated concrete products on the production site located in Germany. Product specific data are based on average values collected in the year 2021. Background data are based on the GaBi LCA software and are less than 10 years old. Generally, the used background datasets are of high quality, and the majority of the datasets are only a couple of years old.

Hazardous substances

The autoclaved aerated concrete products from H+H 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

The autoclaved aerated concrete wall element is covered by harmonised technical specification EN 12602 and for the EPD it follows EN 15804. Declaration of performance according to EU regulation 305/2011 is available for all declared product variations.

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

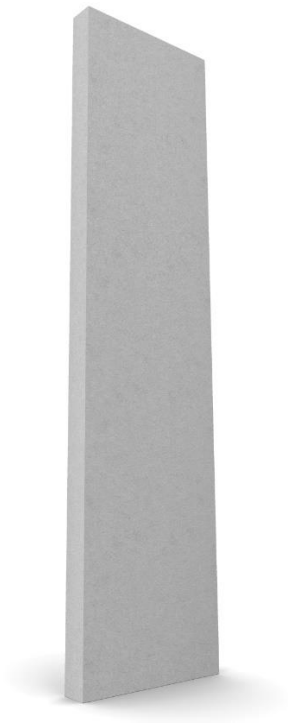
https://www.hplush.dk

Reference Service Life (RSL)

The reference service life (RSL) of the product is set to 80 years.

Picture of product(s)

Below is shown photos of autoclaved aerated concrete wall.



Configuration with plain surface

LCA background

Declared unit

The LCI and LCIA results in this EPD relates to 1 m^3 of autoclaved aerated concrete wall panel with a construction waste percentage of 2%.

Name	AAC 575
Declared unit, m^3	1
Total density per product at the factory gate, kg/m^3	811
Conversion factor to 1 kg	0.0012

Dry density per product, kg/m^3	575
Total density per product for demolition, kg/m^3	595

*As the water content of the aerated concrete wall panels change during their respective lifetime, the density of the dry product and of the demolished product is also provided below.

Functional unit

Not defined.

PCR

This EPD is developed according to the core rules for the product category of construction products in EN 15804 version A2:2019 and cPCR EN 16757:2022 Product Category Rules for concrete and concrete elements.

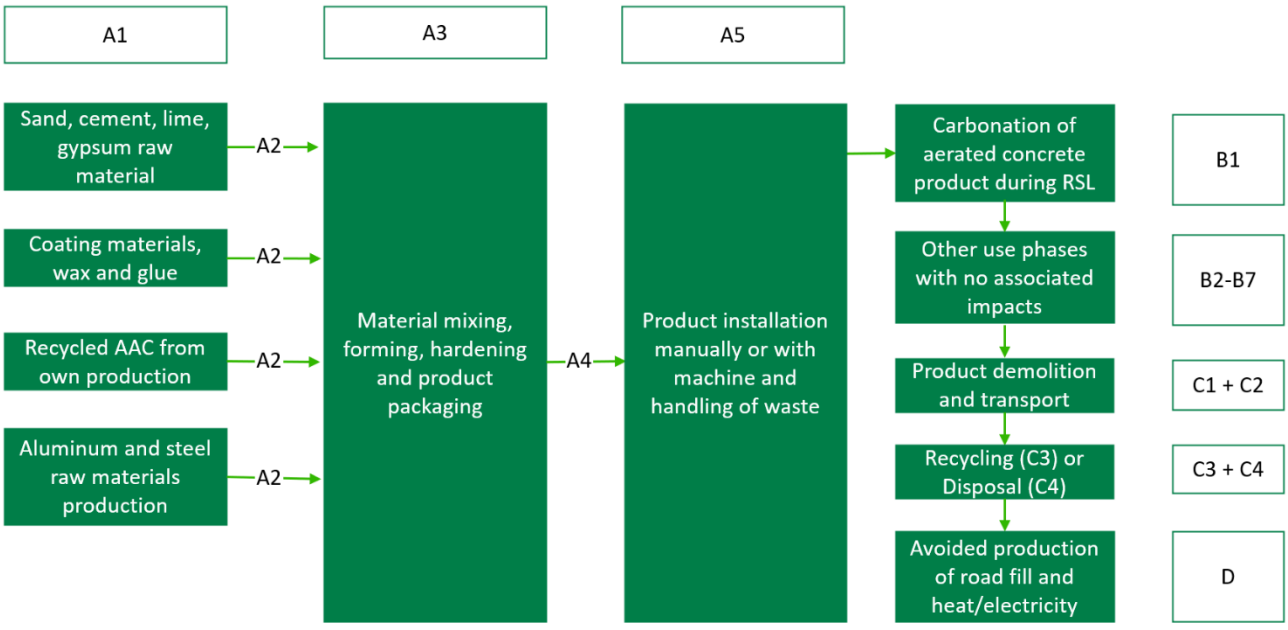
Guarantee of Origin – certificates

No guarantees of origin or certificated are used for green electricity or energy production.

For modelling energy production, the country specific residual mix is used, in accordance with the recommendations from EPD Denmark

Flowdiagram

The process diagram below represents the life cycle of an autoclaved aerated concrete product from H+H.



System boundary

This EPD is based on a cradle-to-gate 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.

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 raw materials used in the production of the autoclaved aerated concrete element has been pre-treated, manufactured, and provided by suppliers. These materials are then dosed and mixed in the mixer to form an aqueous suspension. The mixture is poured into casting moulds, where air pores are created with chemical reactions. The homogeneous structure is exposed to a saturated steam atmosphere to form specific characteristic properties for the autoclaved aerated concrete products.

Construction process stage (A4-A5) 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 autoclaved aerated concrete wall panel is installed in Europe.

The autoclaved aerated concrete wall elements are installed using a battery powered electro-hydraulic machine from H+H.

A flat amount of construction waste is assumed for all products equal to 2%, which is added to the output from the production. The declared product is thus the inclusion of the construction waste in the product.

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 take place in Europe and are 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.

For B1 CO_2-uptake from carbonation has been calculated based on the reactive CaO specifications on each product and the rate of carbonation set to 95%.

Additionally, the autoclaved aerated concrete wall panel contain water that is evaporated during the use phase until each wall panel is in moisture equilibrium with the surrounding atmosphere.

End of Life (C1-C4) includes:

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

The autoclaved aerated concrete products are assumed demolished using an excavator (C1). Impacts are accounted for in the form of diesel consumption from the excavator used for

demolition, sorting, placement, and additional crushing of autoclaved aerated concrete waste elements in large piles and loading of concrete waste onto a semi-trailer used for the waste transport.

At the recycling facility the autoclaved aerated concrete is crushed (C3), where after 95% are recycled and used as road fill. The remaining 5% of the autoclaved aerated concrete is sent to a local landfill (C4)

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 product, however, only the quantity of the product which constitutes primary material. The added recycled materials in the products have not been credited in D.

LCA results

The tables below cover the H+H wall panels with a dry density of 575 kg/m³.

ENVIRONMENTAL EFFECTS PER PRODUKT PER M³											
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	[kg CO_2 eq.]	2,13E+02	6,41E+01	3,62E+00	-9,46E+01	0,00E+00	5,77E+00	4,54E+00	6,41E+00	2,59E-01	-2,65E+00
GWP-fossil	[kg CO_2 eq.]	2,13E+02	6,34E+01	2,90E+00	-9,46E+01	0,00E+00	5,74E+00	4,49E+00	6,35E+00	2,66E-01	-2,67E+00
GWP-bio	[kg CO_2 eq.]	-2,12E-01	2,66E-01	7,27E-01	0,00E+00	0,00E+00	1,26E-03	1,88E-02	1,75E-02	-7,89E-03	2,02E-02
GWP-luluc	[kg CO_2 eq.]	5,22E-02	4,34E-01	6,56E-04	0,00E+00	0,00E+00	2,91E-02	3,08E-02	3,69E-02	4,92E-04	-3,15E-03
ODP	[kg CFC 11 eq.]	2,75E-07	6,33E-12	6,51E-13	0,00E+00	0,00E+00	4,23E-13	4,49E-13	5,37E-13	6,26E-13	-1,29E-11
AP	[mol H^+ eq.]	1,72E-01	7,20E-02	1,12E-03	0,00E+00	0,00E+00	2,78E-02	5,10E-03	1,41E-02	1,89E-03	-7,34E-03
EP-fw	[kg PO_4 eq.]	1,60E-04	2,30E-04	4,83E-07	0,00E+00	0,00E+00	1,54E-05	1,63E-05	1,95E-05	4,52E-07	-5,58E-06
EP-mar	[kg N eq.]	5,35E-02	2,32E-02	3,37E-04	0,00E+00	0,00E+00	1,32E-02	1,64E-03	6,04E-03	4,83E-04	-2,52E-03
EP-ter	[mol N eq.]	5,86E-01	2,78E-01	5,09E-03	0,00E+00	0,00E+00	1,46E-01	1,97E-02	6,81E-02	5,31E-03	-2,77E-02
POCP	[kg NMVOC eq.]	1,53E-01	6,20E-02	8,88E-04	0,00E+00	0,00E+00	3,69E-02	4,39E-03	1,66E-02	1,47E-03	-6,95E-03
ADP-mm[1]	[kg Sb eq.]	1,32E-05	6,50E-06	2,40E-08	0,00E+00	0,00E+00	4,35E-07	4,61E-07	5,51E-07	2,73E-08	-3,17E-07
ADP-fos[1]	[MJ]	1,16E+03	8,46E+02	2,41E+00	0,00E+00	0,00E+00	5,66E+01	6,00E+01	7,18E+01	3,49E+00	-4,46E+01
WDP[1]	[m^3]	3,54E+00	7,21E-01	3,66E-01	0,00E+00	0,00E+00	4,82E-02	5,11E-02	6,12E-02	2,92E-02	-1,83E-01
Caption	GWP-total = Global Warming Potential - total; GWP-fossil = Global Warming Potential - fossil fuels; GWP-bio = Global Warming Potential - biogenic; GWP-luluc = Global Warming Potential - land use and land use change; ODP = Ozone Depletion; AP = Acidification; EP-freshwater = Eutrophication – aquatic freshwater; EP-marine = Eutrophication – aquatic marine; EP-terrestrial = Eutrophication – terrestrial; POCP = Photochemical zone formation; ADPm = Abiotic Depletion Potential – minerals and metals; ADPf = Abiotic Depletion Potential – fossil fuels; WDP = water use										
Disclaimer	[1] The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.										

ADDITIONAL ENVIRONMENTAL EFFECTS PER PRODUKT PER M³											
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**	**C1**	**C2**	**C3**	**C4**	**D**
PM	[Disease incidence]	3,73E-06	4,95E-07	6,77E-09	0,00E+00	0,00E+00	3,19E-07	3,51E-08	1,40E-07	2,32E-08	-3,55E-07
IRP2	[kBq U235 eq.]	3,45E+00	2,38E-01	8,59E-03	0,00E+00	0,00E+00	1,59E-02	1,69E-02	2,02E-02	4,32E-03	-5,28E-01
ETP-fw1	[CTUe]	2,99E+02	6,00E+02	1,32E+00	0,00E+00	0,00E+00	4,01E+01	4,25E+01	5,09E+01	1,96E+00	-1,40E+01
HTP-c1	[CTUh]	2,67E-08	1,24E-08	6,06E-11	0,00E+00	0,00E+00	8,27E-10	8,76E-10	1,05E-09	2,98E-10	-9,21E-10
HTP-nc1	[CTUh]	2,21E-06	6,71E-07	3,94E-09	0,00E+00	0,00E+00	5,43E-08	4,75E-08	6,02E-08	3,30E-08	-8,31E-08
SQP1	-	4,20E+02	3,58E+02	8,11E-01	0,00E+00	0,00E+00	2,40E+01	2,54E+01	3,04E+01	7,26E-01	-6,42E+00
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Soil Quality (dimensionless)										
Disclaimers	[1] The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.										
	[2] This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.										

RESSOURCE CONSUMPTION PER PRODUKT PER M³											
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	[MJ]	9,45E+01	5,87E+01	3,74E-01	0,00E+00	0,00E+00	3,92E+00	4,16E+00	4,98E+00	5,24E-01	-7,21E+00
PERM	[MJ]	1,57E+02	0,00E+00	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]	2,29E+02	5,87E+01	3,74E-01	0,00E+00	0,00E+00	3,92E+00	4,16E+00	4,98E+00	5,24E-01	-7,21E+00
PENRE	[MJ]	1,13E+03	8,50E+02	2,41E+00	0,00E+00	0,00E+00	5,68E+01	6,02E+01	7,21E+01	3,49E+00	-4,46E+01
PENRM	[MJ]	5,04E+01	0,00E+00	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]	1,16E+03	8,50E+02	2,41E+00	0,00E+00	0,00E+00	5,68E+01	6,02E+01	7,21E+01	3,49E+00	-4,46E+01
SM	[kg]	2,62E+01	0,00E+00	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	0,00E+00	0,00E+00
NRSF	[MJ]	3,53E+00	0,00E+00	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]	1,18E+00	6,78E-02	8,73E-03	0,00E+00	0,00E+00	4,53E-03	4,80E-03	5,75E-03	8,87E-04	-8,49E-03
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 = Net use of fresh water										

WASTE CATEGORIES AND OUTPUT FLOWS PER PRODUKT PER M³											
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2-B7**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	[kg]	1,14E-03	4,50E-09	1,21E-10	0,00E+00	0,00E+00	3,01E-10	3,19E-10	3,81E-10	1,79E-10	-4,34E-09
NHWD	[kg]	1,43E+01	1,38E-01	4,34E-01	0,00E+00	0,00E+00	9,26E-03	9,81E-03	1,17E-02	1,79E+01	-2,38E+01
RWD	[kg]	2,88E-02	1,58E-03	6,75E-05	0,00E+00	0,00E+00	1,05E-04	1,12E-04	1,34E-04	3,89E-05	-3,44E-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	0,00E+00	0,00E+00
MFR	[kg]	1,10E+00	0,00E+00	1,18E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,77E+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	0,00E+00	0,00E+00
EEE	[MJ]	1,27E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	3,00E+00	0,00E+00	0,00E+00	0,00E+00	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										

BIOGENIC CARBON CONTENT PER PRODUKT PER M³		
Parameter	**Unit**	**At the factory gate**
Biogenic carbon content in product	kg C	5,80E-01
Biogenic carbon content in accompanying packaging	kg C	4,68E-00

Additional information

LCA interpretation

LCIA are relative expressions and do not predict impacts category endpoints, the exceeding of thresholds, safety margins or risks. To understand which processes, contribute the most to the overall impacts, a process contribution analysis was conducted. In the tables presented below, the processes contributing the most to each specific impact category is presented.

Impact Category	Unit	Maximum contribution on category	% of category	Process
GWP-total	[kg CO2 eq.]	85,52	43%	A1: Lime
GWP-fossil	[kg CO2 eq.]	85,47	43%	
GWP-bio emission	[kg CO2 eq.]	1,06	128%	A3: Packaging
GWP-bio uptake	[kg CO2 eq.]	-1,08	-130%	
GWP-luluc	[kg CO2 eq.]	0,314	54%	A4: Transport to the construction site
ODP	[kg CFC 11 eq.]	2,66E-07	97%	A1: Mould oil
AP	[mol H+ eq.]	0,0521	18%	A4: Transport to the construction site
EP-fw	[kg PO4 eq.]	0,0002	38%	
EP-mar	[kg N eq.]	0,0168	17%	
EP-ter	[mol N eq.]	0,2007	19%	
POCP	[kg NMVOC eq.]	0,0448	17%	
ADP-mm	[kg Sb eq.]	0,0000	23%	
ADP-fos	[MJ]	611,80	28%	
WDP	[m3]	0,99	21%	A3: Water

Most of the environmental impacts come from the production of raw materials in module A1. The results show that the transport to the construction site is the dominating process in most of the environmental impact categories that is dominant process. The transport contributes between 17% and 54% to the total impacts. The production of lime makes up 43% of the total Climate Change impacts.

The results are relative contributions. Some processes have a summarized negative result despite individual processes contributing positively to the impact category. This result in some percentages reaching below 0% and above 100%.

Technical information on scenarios

Transport to the building site (A4)

Scenario information	Value	Unit
Fuel type	Diesel (0,021 l/tkm)	-
Vehicle type	Euro 6, 28 - 32t gross weight / 22t payload capacity	-
Transport distance	1000	km
Capacity utilisation (including empty runs)	61	%
Gross density of products transported	-	kg/m^3
Capacity utilisation volume factor	1	-

Installation of the product in the building (A5)

Scenario information	AC 575	Unit
Waste materials (autoclaved aerated concrete wall)	11	kg
Waste materials (packaging)	1	kg

Reference service life

RSL information	Unit
Reference service Life	80 Years
Declared product properties	Technical specifications and guidance can be obtained from direct contact to H+H at Nordics: +45 7024 0050 Germany: +49 4554 7000
Design application parameters	
Assumed quality of work	
Outdoor environment	
Indoor environment	
Usage conditions	
Maintenance	

Use (B1-B7)

Scenario information	AC 575	Unit
B1 – Use		
Carbonation	94,6	kg CO_2-eq

End of life (C1-C4)

Scenario information	AC 575	Unit
Collected separately	595	kg
Collected with mixed waste	0	kg
For reuse	0	kg
For recycling	577	kg
For energy recovery	0	kg
For final disposal	18	kg
Assumptions for scenario development	Assumed dismantled using an excavator.	

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

Scenario information/Materiel	AC 575	Unit
Roadfill	560	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+A2 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+A2 chapter 7.4.2.

References

Publisher	www.epddanmark.dk
Programme operator	Danish Technological Institute Buildings & Environment Gregersensvej DK-2630 Taastrup www.teknologisk.dk
LCA-practitioner	Asger Alexander Wendt Karl & Maria Preilev Hansen Danish Technological Institute Buildings & Environment Gregersensvej DK-2630 Taastrup www.teknologisk.dk
LCA software /background data	Thinkstep GaBi 10.6 Database version 2021.2 www.gabi-software.com
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 + A2:2019 - "Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products"

EN 16757
DS/EN 16757:2022 - "Bæredygtighed indenfor byggeri og anlæg - Miljøvaredeklarationer - Produktkategoriregler for beton og betonelementer"

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"