epddanmark

ECO PLATFORM EPD VERIFIED

Owner:	KALK A/S
No.:	MD-23029-EN_rev1
Issued first time:	28-04-2023
Issued:	07-11-2023
Valid to:	28-04-2028

3rd PARTY **VERIFIED**

EPD

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

Owner of declaration
KALK A/S
Bredeløkkevej 12
4660 Store Heddinge
VAT number: 56394710

Programme
EPD Danmark
www.epddanmark.dk

☐ Industry EPD
☒ Product EPD

Declared product(s)
This EPD includes results for the following 3 dry KKh mortars:
- KKh 20/80/475 tør Hydraulisk kalk
- KKh 35/65/500 tør Hydraulisk kalk
- KKh 100/400 tør Hydraulisk kalk

Number of declared datasets/product variations: 3

Production site
Forumvej 83, Alslev
6800 Varde
Denmark

No green electricity or biogas is used in A3 (production)

Product(s) use
Mortar is used as a binder in various masonry constructions to bind the bricks together. Mortar can also be used in connection with tiling, as well as for plastering and jointing material.

Declared/ functional unit
1000 kg dry mortar

Year of production site data (A3)
2021

EPD version

Second version: Several EPDs merged into one.

Issued: 07-11-2023
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, NIRAS

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	MND	X	X	MND	MND	MND	MND	MND	MND	X	X	X	X	X

Product information

Product description

The material composition of the declared products are shown in the table below as Weight-% of declared products.

Material	KKh 20/80/475	KKh 35/65/500	KKh 100/400
Hydraulic lime NHL5	14,0 %	10,8%	20%
Hydrated lime	3,5 %	5,8%	0%
Dried sand	82,5 %	83,4%	80%

Product packaging

The composition of the sales- and transport packaging of all declared products are identical and is shown in the table below.

Material	KKh 20/80/475	KKh 35/65/500	KKh 100/400
Polypropylene (PP)	100%	100%	100%

Representativity

This declaration, including data collection and the modeled foreground system including results, represents the production of 1000 kg mortar on the production site located in the area Varde in Denmark.

Product specific data are based on average values collected in the period January 2021 to December 2021. Background data are based on GaBi professional 10.6, and ecoinvent 3.9 databases, 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 declared products do 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 declared products are all dry mortars and must be mixed with water before it can be used.

The mortars are manufactured according to: *DS/INF 167/ EN 998-1/EN 998-2.*

Recipe-mortars are characterized by the fact that they are produced from a fixed mixing ratio between certain components. This means that each individual mortar is manufactured according to a specific recipe.

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

https://renovering.kalk.dk/vare-kategori/opmuring/

Reference Service Life (RSL)

The reference service life of mortar products is minimum 60 years. However, since the products in this EPD does not contain cement (with is normally what degrades first in mortar), the lifetime is expected to be much longer than 60 years. As an example, old buildings such as churches where KKh mortar is used, are still standing today (some are more than 700 years old).

Picture of products

Figure 1 – Pictures of the declared products, with packaging.

Figure 2 – Picture of the declared products, without packaging.

LCA background

Declared unit

The LCI and LCIA results in this EPD relate to impacts caused by the production of 1000 kg (1 ton) of dry mortar.

Name	KKh 20/80/475	KKh 35/65/500	KKh 100/400	Unit
Declared unit	1000	1000	1000	Kg
Density	1660	1660	1660	Kg/m3
Conversion factor to 1 kg.	0,001	0,001	0,001	-

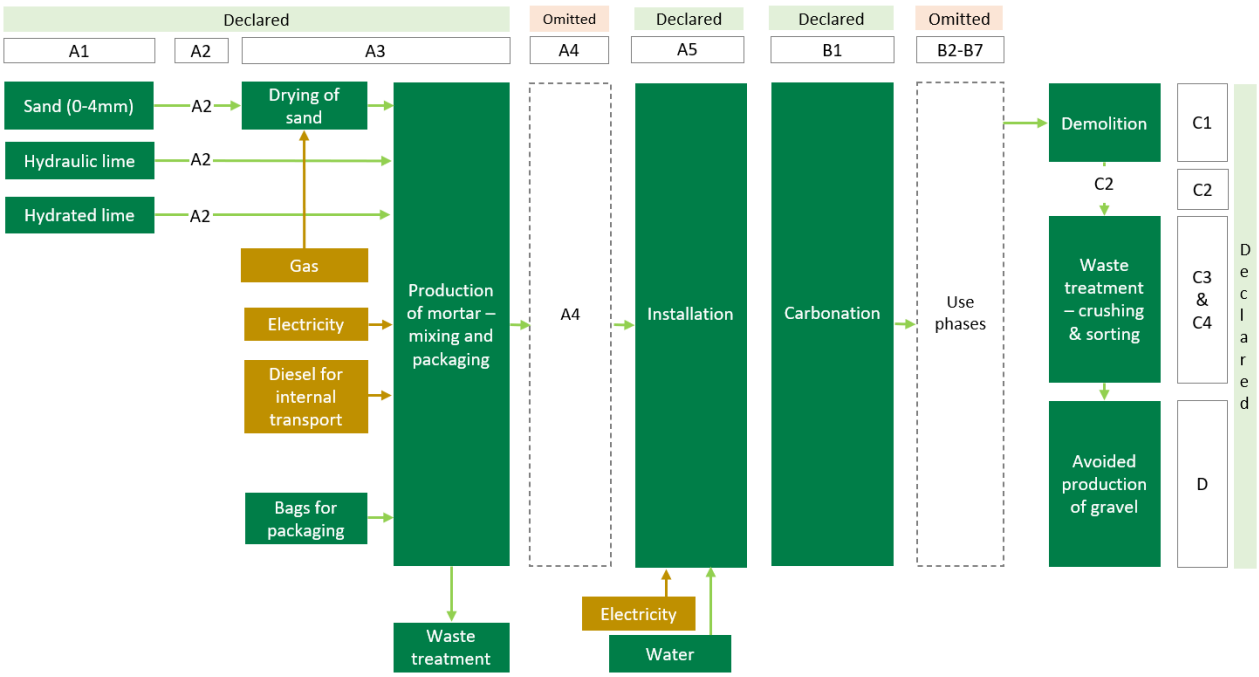
Functional unit

Not defined

PCR

This EPD is developed according to the core rules for the product category of construction products in EN 15804. No product specific PCR is used.

Flowdiagram



Guarantee of Origin – certificates

No certificates or Guarantees of Origin is used in this EPD.

Foreground system:
The products are produced using electricity without the use of GO, which is thus modelled using the Danish residual grid mix in A1-A3.

Background system:
Upstream processes are modelled using country specific grid mix. Downstream processes are modelled using the Danish grid mix.

System boundary

This EPD is based on a cradle-to-gate LCA with options, covering modules A1-A3, B1, C1-C4 and D, 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 production of mortar is generally quite simple, and consists of drying the incoming sand, mixing the materials, and packaging them. Furthermore, there is a bit of transport between the individual processing steps.

Below is a detailed description of the manufacturing steps for the declared products:

The sand is delivered to the production site as wet sand, whereafter it is stored in piles on the site. Before it can be used in the production of mortar, it needs to be dried. To do so, the sand is passed through a drying unit, where the water in the sand evaporates.

After delivery, hydrated lime and hydraulic lime are stored separately in silos.

The dried sand and the lime are hereafter moved to the mixer, where the materials are fed into the mixing-machine using screw conveyers. Once the mortar is mixed, it is packed in bags of different sizes, after which it is ready for delivery.

Construction process stage (A4) includes:

Not declared

Construction process stage (A5) includes:

The dry mortar needs to be mixed with water when used at the construction site. Since the mortar contains hydraulic lime, water is furthermore necessary for the carbonisation processes to take place in B1. All activities in A5, covering water and energy consumption, as well as management of packaging waste are therefore included in A5.

Use stage (B1)

After installation, carbonation is a natural part of the hardening process for mortar.

Carbonation is a chemical reaction where carbon dioxide (CO_2) from the atmosphere reacts with calcium hydroxide in the mortar, to form calcium carbonate and water.

The amount of absorbed CO_2 is determined by the content of active CaO in the mortar, which is calculated based on each product's specific components (including the type of lime used).

Carbonation is included in this EPD and is declared exclusively in B1. There are no other environmental impacts occurring in B1. It is assumed that 100% of the active CaO in the mortar will undergo carbonation.

The use take place in Denmark.

Use stage (B2-B7) includes:

Not declared

End of Life (C1-C4) includes:

Mortar waste is typically disposed of together with bricks, and therefore it is assumed that mortar follows the same End-of-life scenario as bricks. The End-of-life scenario for mortar is therefore modeled according to the following PCR for bricks *"Product Category Rules for Environmental Product Declarations for Construction Clay Products, Study accomplished under the Authority of Tiles and Bricks Europe (TBE)"*

The end-of-life scenario for treatment of mortar waste, is based on current practice in Denmark in the year 2022.

C1: When a building is demolished, mortar is not removed separately, as this would be incredibly comprehensive in practice. Mortar is instead demolished and sorted together with the building elements it is attached to. Specific data for demolition of mortars has not been collected for this project, but instead an average energy consumption for demolishing buildings in Denmark is used.

C2: A transport distance of 50 km is used between C1 and C3. This distance is used, as it represents the average distance from any place in Denmark to a waste treatment facility.

C3-C4: Mortar is typically sorted and processed as a mixed fraction together with bricks/tiles. At the treatment facility, the fraction will undergo a rough sorting process, where larger unwanted fractions are removed. After sorting, the entire fraction is crushed to a size of 0-32mm. After sorting and crushing, 1% is sent to landfill, while 99% is sent for recycling. No foreground data has been obtained on the waste treatment, and therefore a dataset from the GaBi background database is used to model the waste management.

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

The crushed mortar can be used for backfilling and supporting layers in e.g. road construction, cycle paths and squares as a substitute for gravel. The geotechnical properties of the crushed mortar are equal to those of virgin gravel, and it can therefore be used directly as an alternative to virgin gravel. It is therefore assumed that the crushed mortar can replace virgin gravel in a ratio of 1:1.

LCA results

The LCA results for the declared products are presented in the following order:

- KKh 20/80/475 tør Hydraulisk kalk
- KKh 35/65/500 tør Hydraulisk kalk
- KKh 100/400 tør Hydraulisk kalk

Results for KKh 20/80/475 tør Hydraulisk kalk

Table 1 - Core environmental impact indicators

ENVIRONMENTAL IMPACTS PER Ton KKh 20/80/475 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B 1**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	[kg CO_2 eq.]	1,87E+02	3,46E+00	-5,25E+01	4,37E+00	3,32E+00	2,71E+00	1,45E-01	-2,02E+00
GWP-fossil	[kg CO_2 eq.]	1,87E+02	3,46E+00	-5,25E+01	4,32E+00	3,28E+00	2,69E+00	1,49E-01	-2,06E+00
GWP-bio	[kg CO_2 eq.]	4,12E-01	1,40E-03	0,00E+00	2,32E-02	1,38E-02	6,59E-03	-4,42E-03	3,82E-02
GWP-luluc	[kg CO_2 eq.]	8,95E-02	4,77E-05	0,00E+00	2,92E-02	2,25E-02	8,22E-03	2,75E-04	-5,35E-03
ODP	[kg CFC 11 eq.]	4,82E-06	2,11E-12	0,00E+00	4,25E-13	3,28E-13	7,29E-12	3,51E-13	-1,15E-11
AP	[mol H^+ eq.]	3,73E-01	7,15E-04	0,00E+00	5,79E-02	3,74E-03	1,33E-02	1,06E-03	-1,03E-02
EP-fw	[kg P eq.]	1,35E-02	1,59E-06	0,00E+00	1,55E-05	1,19E-05	6,18E-06	2,53E-07	-9,08E-06
EP-mar	[kg N eq.]	1,09E-01	1,61E-04	0,00E+00	2,61E-02	1,21E-03	6,18E-03	2,71E-04	-3,57E-03
EP-ter	[mol N eq.]	1,24E+00	3,15E-03	0,00E+00	2,87E-01	1,45E-02	6,82E-02	2,97E-03	-3,94E-02
POCP	[kg NMVOC eq.]	3,15E-01	4,20E-04	0,00E+00	8,46E-02	3,22E-03	1,67E-02	8,22E-04	-9,75E-03
ADP-mm[1]	[kg Sb eq.]	9,52E-04	4,05E-08	0,00E+00	4,36E-07	3,36E-07	3,06E-06	1,53E-08	-3,50E-07
ADP-fos[1]	[MJ]	1,30E+03	2,95E+00	0,00E+00	5,68E+01	4,38E+01	5,10E+01	1,95E+00	-3,04E+01
WDP[1]	[m^3]	1,42E+01	5,90E+00	0,00E+00	4,84E-02	3,73E-02	4,58E-01	1,64E-02	-2,31E-01
Caption	GWP-total = Globale 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 = Acidifcation; 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.								

Table 2 – Additional environmental impact indicators

ADDITIONAL ENVIRONMENTAL IMPACTS PER Ton KKh 20/80/475 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B1**	**C1**	**C2**	**C3**	**C4**	**D**
PM	[Disease incidence]	5,91E-05	5,18E-09	0,00E+00	2,32E-06	2,57E-08	2,57E-07	1,30E-08	-5,93E-07
IRP[2]	[kBq U235 eq.]	3,91E+00	3,11E-02	0,00E+00	1,60E-02	1,23E-02	3,88E-02	2,42E-03	-3,48E-01
ETP-fw[1]	[CTUe]	2,52E+03	9,20E-01	0,00E+00	4,04E+01	3,11E+01	3,85E+01	1,10E+00	-1,70E+01
HTTP-c[1]	[CTUh]	3,53E-08	5,02E-11	0,00E+00	8,29E-10	6,40E-10	8,27E-10	1,67E-10	-1,28E-09
HTTP-nc[1]	[CTUh]	1,68E-06	2,73E-09	0,00E+00	8,10E-08	3,46E-08	4,31E-08	1,85E-08	-1,30E-07
SQP[1]	-	6,96E+02	2,97E-01	0,00E+00	2,41E+01	1,85E+01	1,13E+01	4,07E-01	-8,95E+00
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer IMPACTS; HTP-nc = Human toxicity – non cancer IMPACTS; 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 IMPACTS 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.								

Table 3 - Parameters describing resource use

RESSOURCE CONSUMPTION PER Ton KKh 20/80/475 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B1**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	[MJ]	8,33E+01	7,91E-01	0,00E+00	3,94E+00	3,04E+00	5,00E+00	2,93E-01	-9,06E+00
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]	8,33E+01	7,91E-01	0,00E+00	3,94E+00	3,04E+00	5,00E+00	2,93E-01	-9,06E+00
PENRE	[MJ]	1,43E+03	2,95E+00	0,00E+00	5,70E+01	4,40E+01	5,11E+01	1,96E+00	-3,05E+01
PENRM	[MJ]	9,20E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	1,52E+03	2,95E+00	0,00E+00	5,70E+01	4,40E+01	5,11E+01	1,96E+00	-3,05E+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	[m^3]	4,76E-01	1,38E-01	0,00E+00	4,55E-03	3,51E-03	1,32E-02	4,97E-04	-9,45E-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								

Table 4 – End-of-life (waste categories and output flows)

WASTE CATEGORIES AND OUTPUT FLOWS PER Ton KKh 20/80/475 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B1**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	[kg]	3,52E-08	1,68E-10	0,00E+00	3,02E-10	2,33E-10	6,88E-10	1,01E-10	-1,56E-09
NHWD	[kg]	3,64E+01	6,35E-02	0,00E+00	9,29E-03	7,17E-03	1,53E-02	1,00E+01	-4,12E+01
RWD	[kg]	1,21E-02	2,80E-04	0,00E+00	1,06E-04	8,17E-05	3,94E-04	2,18E-05	-2,09E-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	9,90E+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]	1,36E+00	7,42E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	2,56E+00	3,15E+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								

Table 5 – Biogenic carbon content at factory gate

BIOGENIC CARBON CONTENT PER ton KKh 20/80/475 tør Hydraulisk kalk		
Parameter	**Unit**	**At the factory gate**
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	0,00E+00

Results for KKh 35/65/500 tør Hydraulisk kalk

Table 6 - Core environmental impact indicators

ENVIRONMENTAL IMPACTS PER Ton KKh 35/65/500 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B 1**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	[kg CO_2 eq.]	1,78E+02	3,46E+00	-5,72E+01	4,37E+00	3,32E+00	2,71E+00	1,45E-01	-2,02E+00
GWP-fossil	[kg CO_2 eq.]	1,78E+02	3,46E+00	-5,72E+01	4,32E+00	3,28E+00	2,69E+00	1,49E-01	-2,06E+00
GWP-bio	[kg CO_2 eq.]	3,37E-01	1,40E-03	0,00E+00	2,32E-02	1,38E-02	6,59E-03	-4,42E-03	3,82E-02
GWP-luluc	[kg CO_2 eq.]	7,73E-02	4,77E-05	0,00E+00	2,92E-02	2,25E-02	8,22E-03	2,75E-04	-5,35E-03
ODP	[kg CFC 11 eq.]	3,72E-06	2,11E-12	0,00E+00	4,25E-13	3,28E-13	7,29E-12	3,51E-13	-1,15E-11
AP	[mol H^+ eq.]	3,07E-01	7,15E-04	0,00E+00	5,79E-02	3,74E-03	1,33E-02	1,06E-03	-1,03E-02
EP-fw	[kg P eq.]	1,04E-02	1,59E-06	0,00E+00	1,55E-05	1,19E-05	6,18E-06	2,53E-07	-9,08E-06
EP-mar	[kg N eq.]	9,17E-02	1,61E-04	0,00E+00	2,61E-02	1,21E-03	6,18E-03	2,71E-04	-3,57E-03
EP-ter	[mol N eq.]	1,04E+00	3,15E-03	0,00E+00	2,87E-01	1,45E-02	6,82E-02	2,97E-03	-3,94E-02
POCP	[kg NMVOC eq.]	2,64E-01	4,20E-04	0,00E+00	8,46E-02	3,22E-03	1,67E-02	8,22E-04	-9,75E-03
ADP-mm[1]	[kg Sb eq.]	7,36E-04	4,05E-08	0,00E+00	4,36E-07	3,36E-07	3,06E-06	1,53E-08	-3,50E-07
ADP-fos[1]	[MJ]	1,19E+03	2,95E+00	0,00E+00	5,68E+01	4,38E+01	5,10E+01	1,95E+00	-3,04E+01
WDP[1]	[m^3]	1,17E+01	5,90E+00	0,00E+00	4,84E-02	3,73E-02	4,58E-01	1,64E-02	-2,31E-01
Caption	GWP-total = Globale 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 = Acidifcation; 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.								

Table 7 – Additional environmental impact indicators

ADDITIONAL ENVIRONMENTAL IMPACTS PER Ton KKh 35/65/500 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B1**	**C1**	**C2**	**C3**	**C4**	**D**
PM	[Disease incidence]	5,88E-05	5,18E-09	0,00E+00	2,32E-06	2,57E-08	2,57E-07	1,30E-08	-5,93E-07
IRP[2]	[kBq U235 eq.]	3,46E+00	3,11E-02	0,00E+00	1,60E-02	1,23E-02	3,88E-02	2,42E-03	-3,48E-01
ETP-fw[1]	[CTUe]	1,99E+03	9,20E-01	0,00E+00	4,04E+01	3,11E+01	3,85E+01	1,10E+00	-1,70E+01
HTTP-c[1]	[CTUh]	3,16E-08	5,02E-11	0,00E+00	8,29E-10	6,40E-10	8,27E-10	1,67E-10	-1,28E-09
HTTP-nc[1]	[CTUh]	1,71E-06	2,73E-09	0,00E+00	8,10E-08	3,46E-08	4,31E-08	1,85E-08	-1,30E-07
SQP[1]	-	5,57E+02	2,97E-01	0,00E+00	2,41E+01	1,85E+01	1,13E+01	4,07E-01	-8,95E+00
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer IMPACTS; HTP-nc = Human toxicity – non cancer IMPACTS; 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 IMPACTS 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.								

Table 8 - Parameters describing resource use

RESSOURCE CONSUMPTION PER Ton KKh 35/65/500 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B1**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	[MJ]	8,33E+01	7,91E-01	0,00E+00	3,94E+00	3,04E+00	5,00E+00	2,93E-01	-9,06E+00
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]	8,33E+01	7,91E-01	0,00E+00	3,94E+00	3,04E+00	5,00E+00	2,93E-01	-9,06E+00
PENRE	[MJ]	1,43E+03	2,95E+00	0,00E+00	5,70E+01	4,40E+01	5,11E+01	1,96E+00	-3,05E+01
PENRM	[MJ]	9,20E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	1,52E+03	2,95E+00	0,00E+00	5,70E+01	4,40E+01	5,11E+01	1,96E+00	-3,05E+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	[m^3]	4,76E-01	1,38E-01	0,00E+00	4,55E-03	3,51E-03	1,32E-02	4,97E-04	-9,45E-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								

Table 9 – End-of-life (waste categories and output flows)

WASTE CATEGORIES AND OUTPUT FLOWS PER Ton KKh 35/65/500 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B1**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	[kg]	3,98E-08	1,68E-10	0,00E+00	3,02E-10	2,33E-10	6,88E-10	1,01E-10	-1,56E-09
NHWD	[kg]	3,68E+01	6,35E-02	0,00E+00	9,29E-03	7,17E-03	1,53E-02	1,00E+01	-4,12E+01
RWD	[kg]	1,33E-02	2,80E-04	0,00E+00	1,06E-04	8,17E-05	3,94E-04	2,18E-05	-2,09E-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	9,90E+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]	1,36E+00	7,42E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	2,56E+00	3,15E+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								

Table 10 – Biogenic carbon content at factory gate

BIOGENIC CARBON CONTENT PER ton KKh 35/65/500 tør Hydraulisk kalk		
Parameter	**Unit**	**At the factory gate**
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	0,00E+00

Results for KKh 100/400 tør Hydraulisk kalk

Table 11 - Core environmental impact indicators

ENVIRONMENTAL IMPACTS PER Ton KKh 100/400 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B 1**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	[kg CO_2 eq.]	2,12E+02	3,46E+00	-4,80E+01	4,37E+00	3,32E+00	2,71E+00	1,45E-01	-2,02E+00
GWP-fossil	[kg CO_2 eq.]	2,11E+02	3,46E+00	-4,80E+01	4,32E+00	3,28E+00	2,69E+00	1,49E-01	-2,06E+00
GWP-bio	[kg CO_2 eq.]	5,56E-01	1,40E-03	0,00E+00	2,32E-02	1,38E-02	6,59E-03	-4,42E-03	3,82E-02
GWP-luluc	[kg CO_2 eq.]	1,14E-01	4,77E-05	0,00E+00	2,92E-02	2,25E-02	8,22E-03	2,75E-04	-5,35E-03
ODP	[kg CFC 11 eq.]	6,89E-06	2,11E-12	0,00E+00	4,25E-13	3,28E-13	7,29E-12	3,51E-13	-1,15E-11
AP	[mol H^+ eq.]	5,01E-01	7,15E-04	0,00E+00	5,79E-02	3,74E-03	1,33E-02	1,06E-03	-1,03E-02
EP-fw	[kg P eq.]	1,92E-02	1,59E-06	0,00E+00	1,55E-05	1,19E-05	6,18E-06	2,53E-07	-9,08E-06
EP-mar	[kg N eq.]	1,42E-01	1,61E-04	0,00E+00	2,61E-02	1,21E-03	6,18E-03	2,71E-04	-3,57E-03
EP-ter	[mol N eq.]	1,62E+00	3,15E-03	0,00E+00	2,87E-01	1,45E-02	6,82E-02	2,97E-03	-3,94E-02
POCP	[kg NMVOC eq.]	4,11E-01	4,20E-04	0,00E+00	8,46E-02	3,22E-03	1,67E-02	8,22E-04	-9,75E-03
ADP-mm[1]	[kg Sb eq.]	1,36E-03	4,05E-08	0,00E+00	4,36E-07	3,36E-07	3,06E-06	1,53E-08	-3,50E-07
ADP-fos[1]	[MJ]	1,54E+03	2,95E+00	0,00E+00	5,68E+01	4,38E+01	5,10E+01	1,95E+00	-3,04E+01
WDP[1]	[m^3]	1,91E+01	5,90E+00	0,00E+00	4,84E-02	3,73E-02	4,58E-01	1,64E-02	-2,31E-01
Caption	GWP-total = Globale 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 = Acidifcation; 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.								

Table 12 – Additional environmental impact indicators

ADDITIONAL ENVIRONMENTAL IMPACTS PER Ton KKh 100/400 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B1**	**C1**	**C2**	**C3**	**C4**	**D**
PM	[Disease incidence]	5,98E-05	5,18E-09	0,00E+00	2,32E-06	2,57E-08	2,57E-07	1,30E-08	-5,93E-07
IRP[2]	[kBq U235 eq.]	4,79E+00	3,11E-02	0,00E+00	1,60E-02	1,23E-02	3,88E-02	2,42E-03	-3,48E-01
ETP-fw[1]	[CTUe]	3,52E+03	9,20E-01	0,00E+00	4,04E+01	3,11E+01	3,85E+01	1,10E+00	-1,70E+01
HTTP-c[1]	[CTUh]	4,31E-08	5,02E-11	0,00E+00	8,29E-10	6,40E-10	8,27E-10	1,67E-10	-1,28E-09
HTTP-nc[1]	[CTUh]	1,72E-06	2,73E-09	0,00E+00	8,10E-08	3,46E-08	4,31E-08	1,85E-08	-1,30E-07
SQP[1]	-	9,62E+02	2,97E-01	0,00E+00	2,41E+01	1,85E+01	1,13E+01	4,07E-01	-8,95E+00
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer IMPACTS; HTP-nc = Human toxicity – non cancer IMPACTS; 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 IMPACTS 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.								

Table 13 - Parameters describing resource use

RESSOURCE CONSUMPTION PER Ton KKh 100/400 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B1**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	[MJ]	8,33E+01	7,91E-01	0,00E+00	3,94E+00	3,04E+00	5,00E+00	2,93E-01	-9,06E+00
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]	8,33E+01	7,91E-01	0,00E+00	3,94E+00	3,04E+00	5,00E+00	2,93E-01	-9,06E+00
PENRE	[MJ]	1,43E+03	2,95E+00	0,00E+00	5,70E+01	4,40E+01	5,11E+01	1,96E+00	-3,05E+01
PENRM	[MJ]	9,20E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	1,52E+03	2,95E+00	0,00E+00	5,70E+01	4,40E+01	5,11E+01	1,96E+00	-3,05E+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	[m^3]	4,76E-01	1,38E-01	0,00E+00	4,55E-03	3,51E-03	1,32E-02	4,97E-04	-9,45E-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								

Table 14 – End-of-life (waste categories and output flows)

WASTE CATEGORIES AND OUTPUT FLOWS PER Ton KKh 100/400 tør Hydraulisk kalk									
Parameter	**Unit**	**A1-A3**	**A5**	**B1**	**C1**	**C2**	**C3**	**C4**	**D**
HWD	[kg]	2,80E-08	1,68E-10	0,00E+00	3,02E-10	2,33E-10	6,88E-10	1,01E-10	-1,56E-09
NHWD	[kg]	3,53E+01	6,35E-02	0,00E+00	9,29E-03	7,17E-03	1,53E-02	1,00E+01	-4,12E+01
RWD	[kg]	1,03E-02	2,80E-04	0,00E+00	1,06E-04	8,17E-05	3,94E-04	2,18E-05	-2,09E-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	9,90E+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]	1,36E+00	7,42E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	[MJ]	2,56E+00	3,15E+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								

Table 15 – Biogenic carbon content at factory gate

BIOGENIC CARBON CONTENT PER ton KKh 100/400 tør Hydraulisk kalk		
Parameter	**Unit**	**At the factory gate**
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	0,00E+00

Additional information

LCA interpretation

The tables below show which processes contribute most to each specific impact category for each product.

Impacts per ton KKh 20/80/475 tør hydraulisk kalk				
Impact Category	**Unit**	**Maximum contribution on category**	**Process**	**Percentage of category**
Climate Change - total	[kg CO_2 eq.]	1,28E+02	A1: Hydraulic lime/NHL5	66%
Climate Change, fossil	[kg CO_2 eq.]	1,27E+02	A1: Hydraulic lime/NHL5	66%
Climate Change, biogenic	[kg CO_2 eq.]	3,45E-01	A1: Hydraulic lime/NHL5	70%
Climate Change, land use and land use change	[kg CO_2 eq.]	4,60E-02	A2: Transport NHL5	32%
Ozone depletion	[kg CFC 11 eq.]	4,82E-06	A1: Hydraulic lime/NHL5	100%
Acidification	[mol H^+ eq.]	3,11E-01	A1: Hydraulic lime/NHL5	71%
Eutrophication, freshwater	[kg P eq.]	1,34E-02	A1: Hydraulic lime/NHL5	99%
Eutrophication, marine	[kg N eq.]	8,35E-02	A1: Hydraulic lime/NHL5	60%
Eutrophication, terrestrial	[mol N eq.]	9,62E-01	A1: Hydraulic lime/NHL5	61%
Photochemical ozone formation, human health	[kg NMVOC eq.]	2,41E-01	A1: Hydraulic lime/NHL5	59%
Resource use, mineral and metals	[kg Sb eq.]	9,49E-04	A1: Hydraulic lime/NHL5	99%
Resource use, fossils	[MJ]	7,11E+02	A1: Hydraulic lime/NHL5	51%
Water use	[m^3]	1,28E+01	A1: Hydraulic lime/NHL5	63%

The contribution analysis shows that the manufacturing of Hydraulic lime in A1 is the most dominant process in all impact categories, except for "Climate Change, land use and land use change" where the transport of lime in A2 is the most contributing process.

Impacts per ton KKh 35/65/500 tør hydraulisk kalk				
Impact Category	**Unit**	**Maximum contribution on category**	**Process**	**Percentage of category**
Climate Change - total	[kg CO_2 eq.]	9,84E+01	A1: Hydraulic lime/NHL5	53%
Climate Change, fossil	[kg CO_2 eq.]	9,81E+01	A1: Hydraulic lime/NHL5	53%
Climate Change, biogenic	[kg CO_2 eq.]	2,66E-01	A1: Hydraulic lime/NHL5	64%
Climate Change, land use and land use change	[kg CO_2 eq.]	3,55E-02	A2: Transport NHL5	27%
Ozone depletion	[kg CFC 11 eq.]	3,72E-06	A1: Hydraulic lime/NHL5	100%
Acidification	[mol H^+ eq.]	2,40E-01	A1: Hydraulic lime/NHL5	65%
Eutrophication, freshwater	[kg P eq.]	1,03E-02	A1: Hydraulic lime/NHL5	99%
Eutrophication, marine	[kg N eq.]	6,44E-02	A1: Hydraulic lime/NHL5	53%
Eutrophication, terrestrial	[mol N eq.]	7,42E-01	A1: Hydraulic lime/NHL5	54%
Photochemical ozone formation, human health	[kg NMVOC eq.]	1,86E-01	A1: Hydraulic lime/NHL5	52%
Resource use, mineral and metals	[kg Sb eq.]	7,32E-04	A1: Hydraulic lime/NHL5	99%
Resource use, fossils	[MJ]	5,49E+02	A1: Hydraulic lime/NHL5	42%
Water use	[m^3]	9,89E+00	A1: Hydraulic lime/NHL5	55%

The contribution analysis shows that the manufacturing of Hydraulic lime in A1 is the most dominant process in all impact categories, except for "Climate Change, land use and land use change" where the transport of lime in A2 is the most contributing process.

Impacts per ton KKh 100/400 tør hydraulisk kalk				
Impact Category	**Unit**	**Maximum contribution on category**	**Process**	**Percentage of category**
Climate Change - total	[kg CO_2 eq.]	1,82E+02	A1: Hydraulic lime/NHL5	83%
Climate Change, fossil	[kg CO_2 eq.]	1,82E+02	A1: Hydraulic lime/NHL5	83%
Climate Change, biogenic	[kg CO_2 eq.]	4,93E-01	A1: Hydraulic lime/NHL5	77%
Climate Change, land use and land use change	[kg CO_2 eq.]	6,57E-02	A2: Transport NHL5	39%
Ozone depletion	[kg CFC 11 eq.]	6,89E-06	A1: Hydraulic lime/NHL5	100%
Acidification	[mol H^+ eq.]	4,44E-01	A1: Hydraulic lime/NHL5	79%
Eutrophication, freshwater	[kg P eq.]	1,92E-02	A1: Hydraulic lime/NHL5	100%
Eutrophication, marine	[kg N eq.]	1,19E-01	A1: Hydraulic lime/NHL5	70%
Eutrophication, terrestrial	[mol N eq.]	1,37E+00	A1: Hydraulic lime/NHL5	70%
Photochemical ozone formation, human health	[kg NMVOC eq.]	3,45E-01	A1: Hydraulic lime/NHL5	68%
Resource use, mineral and metals	[kg Sb eq.]	1,36E-03	A1: Hydraulic lime/NHL5	100%
Resource use, fossils	[MJ]	1,02E+03	A1: Hydraulic lime/NHL5	62%
Water use	[m^3]	1,83E+01	A1: Hydraulic lime/NHL5	72%

The contribution analysis shows that the manufacturing of Hydraulic lime in A1 is the most dominant process in all impact categories, except for "Climate Change, land use and land use change" where the transport of lime in A2 is the most contributing process.

Technical information on scenarios

The Technical information on scenarios is identical for all products, thus the tables presented below are representative for all the declared products:

Reference service life

RSL information		Unit
Reference service Life	60*	Years
Declared product properties	-	As appropriate
Design application parameters	-	As appropriate
Assumed quality of work	-	As appropriate
Outdoor environment	Can be used both indoors and outdoors	As appropriate
Indoor environment		As appropriate
Usage conditions	-	As appropriate
Maintenance	No maintenance is required during the 60 years.	As appropriate
* The reference service life of mortar products is minimum 60 years. However since the product in this EPD does not contain cement (with is normally what degrades first in mortar), the lifetime is expected to be much longer than 60 years. As an example, old buildings such as churches where KKh mortar is used, are still standing today (some are more than 700 years old).		

End of life (C1-C4)

Name	Value	Unit
Seperated construction waste	0	kg
Mixed construction waste	1000	kg
For reuse	0	kg
For recycling	990	kg
For energy recovery	0	kg
For landfill	10	kg
Assumptions regarding the treatment scenario	Common practice in Denmark in 2022	-

Re-use, recovery and recycling potential (D)

Name	Value	Unit
Substitued virgin gravel 0-32mm	990	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	epddanmark www.epddanmark.dk
Programme operator	Danish Technological Institute Buildings & Environment Gregersensvej DK-2630 Taastrup www.teknologisk.dk
LCA-practitioner	Ulf Smith Minke Danish Technological Institute Buildings & Environment Gregersensvej DK-2630 Taastrup www.teknologisk.dk
LCA software /background data	Thinkstep GaBi version 10.6.1.35, 2022 including databases www.gabi-software.com
3rd party verifier	Ninkie Bendtsen NIRAS Sortemosevej 19 3450 Allerød Denmark 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 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"