

Owner: Centrum Pæle A/S
No.: MD-21004-EN
Issued: 10-03-2021
Valid for: 10-03-2026

3rd PARTY VERIFIED

EPD

VERIFIED ENVIRONMENTAL PRODUCT DECLARATION | ISO 14025 & EN 15804



Owner of the Declaration

Centrum Pæle A/S
CVR: 27242561



Issued
10-03-2021

Valid until:
10-03-2026

Programme

EPD Denmark
www.epddanmark.dk



- Industry EPD
 Product EPD

Declared product

1 meter steel reinforced foundation pile in concrete
Additions in the form of:
- Coating with bitumen
- Addition of extra rebar
- Energy pile hoses for geothermal heating/cooling

Number of declared data sets/product variations: 5

25cm x 25cm, type 6, with 6 rebar
30cm x 30cm, type 8, with 8 rebar
35cm x 35cm, type 12, with 12 rebar
40cm x 40cm, type 12, with 12 rebar
45cm x 45cm, type 16, with 16 rebar

Number of additions: 7

Bitumen on foundation pile 25cm x 25cm
Bitumen on foundation pile 30cm x 30cm
Bitumen on foundation pile 35cm x 35cm
Bitumen on foundation pile 40cm x 40cm
Bitumen on foundation pile 45cm x 45cm
Type +/- 1, i.e. addition/removal of rebar
Hoses for energy pile

Production location

Centrum Pæle's production location in Vejle.

Use of the product

Foundation for buildings and construction works.

Declared/functional unit

Declared unit is 1 meter steel reinforced foundation pile in concrete.

Reference year

2020

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
 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

- internal external

Third party verifier:



Ninkie Bendtsen, Niras A/S



Henrik Fred Larsen
EPD Denmark

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

Product		Construction process			Use								End of life			Outside system boundary
Raw material supply	Transport	Manufacturing	Transport	Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/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	MND	MND	MND	MND	MND	MND	MND	MND	MNR	MNR	MNR	MNR	MNR

Product information

Product description

The main materials of the product are listed in the table below. These represent 100% (w/w) of the declared product.

Material	25x25, type 6	30x30, type 8	35x35, type 12	40x40, type 12	45x45, type 16
Aggregates	44%	45%	45%	45%	45%
Sand	30%	30%	30%	30%	30%
Cement	16%	16%	16%	16%	16%
Water	5.1%	5.1%	5.1%	5.1%	5.1%
Additive, air entrainer	< 1%	< 1%	< 1%	< 1%	< 1%
Additive, superplasticizer	< 1%	< 1%	< 1%	< 1%	< 1%
Additive, plasticizer	< 1%	< 1%	< 1%	< 1%	< 1%
Additive, hardener	< 1%	< 1%	< 1%	< 1%	< 1%
Plastic spacers	0.03%	0.02%	0.02%	0.01%	0.01%
Steel lifting anchor	0.1%	0.1%	0.1%	0.1%	0.1%
Rebar	3.5%	3.2%	3.5%	2.8%	2.9%
Hanger thread	0.8%	0.7%	0.6%	0.6%	0.5%
Plastic label	0.003%	0.002%	0.001%	0.002%	0.002%
Weight	151 kg	218 kg	298 kg	388 kg	491 kg

Additions to foundation piles use the materials listed in the table below. Note that some numbers are negative, since additional rebars and energy hoses displace concrete.

The material in 'Type +/- 1' must change signs if reinforcing bars are removed. Thus, the use of aggregates is increased by the removal of 2 rebars: $(-2) \times (-1.25E-01) \text{ kg} = 0.25\text{kg}$

Material	Bitumen, 25x25	Bitumen, 30x30	Bitumen, 35x35	Bitumen, 40x40	Bitumen, 45x45	Type +/- 1	Energy pile	Unit
Aggregates	-	-	-	-	-	-1.25E-01	-2.65E+00	kg
Sand	-	-	-	-	-	-8.43E-02	-1.79E+00	kg
Cement	-	-	-	-	-	-4.43E-02	-9.39E-01	kg
Water	-	-	-	-	-	-1.43E-02	-3.02E-01	kg
Additive, air entrainer	-	-	-	-	-	< -1	< -10	g
Additive, superplasticizer	-	-	-	-	-	< -1	< -10	g
Additive, plasticizer	-	-	-	-	-	< -1	< -10	g
Additive, hardener	-	-	-	-	-	< -1	< -10	g
Rebar	-	-	-	-	-	9.10E-01	-	kg
Bitumen	7.08E-01	8.50E-01	9.91E-01	1.13E+00	1.27E+00	-	-	kg
Plastic hose	-	-	-	-	-	-	8.20E-01	kg
Weight	7.08E-01	8.50E-01	9.91E-01	1.13E+00	1.27E+00	6.42E-01	-4.79E+00	kg

Representativeness

The declared unit is 1 meter reinforced foundation pile in concrete, with possible additions.

Data for the underlying LCA are based on annual averages for the production of foundation piles in the year 2020.

Background data is based on the GaBi database version 2020.2. Most data is less than 5 years old, and all data is less than 10 years old in accordance with EN15804:2012+A2:2019. The exception is additives in concrete, where the total quantity is less than 0.2% (w/w).

Content of dangerous substances

The product does not contain substances from the REACH Candidate List, the "Candidate List of Substances of Very High Concern for Authorisation", in concentrations which exceeds 0.1% (<http://echa.europa.eu/candidate-list-table>).

Essential properties (CE)

The foundation piles comply with the requirements of DS/EN 12794 + /A1:2007 + AC:2008; Prefabricated concrete elements - Foundation piles.

Performance declarations on each pole can be found here: <https://www.centrumpaele.dk/paele.aspx>

Life expectancy (RSL)

Lifetime is counted as 100 years (RSL) cf. Annex AA in "DS/EN 16757:2017 – "Sustainability in construction and construction – environmental product declarations – Product category rules for concrete and concrete elements".

Photo of product



LCA background

Declared unit

LCI and LCIA results in this EPD relate to the declared unit 1 meter foundation pile, indicated in the table below, with weight per meter and a conversion factor to 1 kg.

Name	25x25, type 6	30x30, type 8	35x35, type 12	40x40, type 12	45x45, type 16
Declared unit	1 meter	1 meter	1 meter	1 meter	1 meter
Weight, kg	1.51E+02	2.18E+02	2.98E+02	3.88E+02	4.91E+02
Conversion factor to 1 kg	0.006614	0.004578	0.003354	0.002579	0.002037

Additions to the base models are given in the table below, indicating weight and conversion to 1 kg.

Name	Bitumen, 25x25	Bitumen, 30x30	Bitumen, 35x35	Bitumen, 40x40	Bitumen, 45x45	Type +/- 1	Energy pile
Declared unit	1 meter	1 meter	1 meter				
Weight, kg	7.08E-01	8.50E-01	9.91E-01	1.13E+00	1.27E+00	6.42E-01	-4.79E+00
Conversion factor to 1 kg	1.4125	1.1771	1.0089	0.8828	0.7847	1.5575	-0.2090

Functional unit

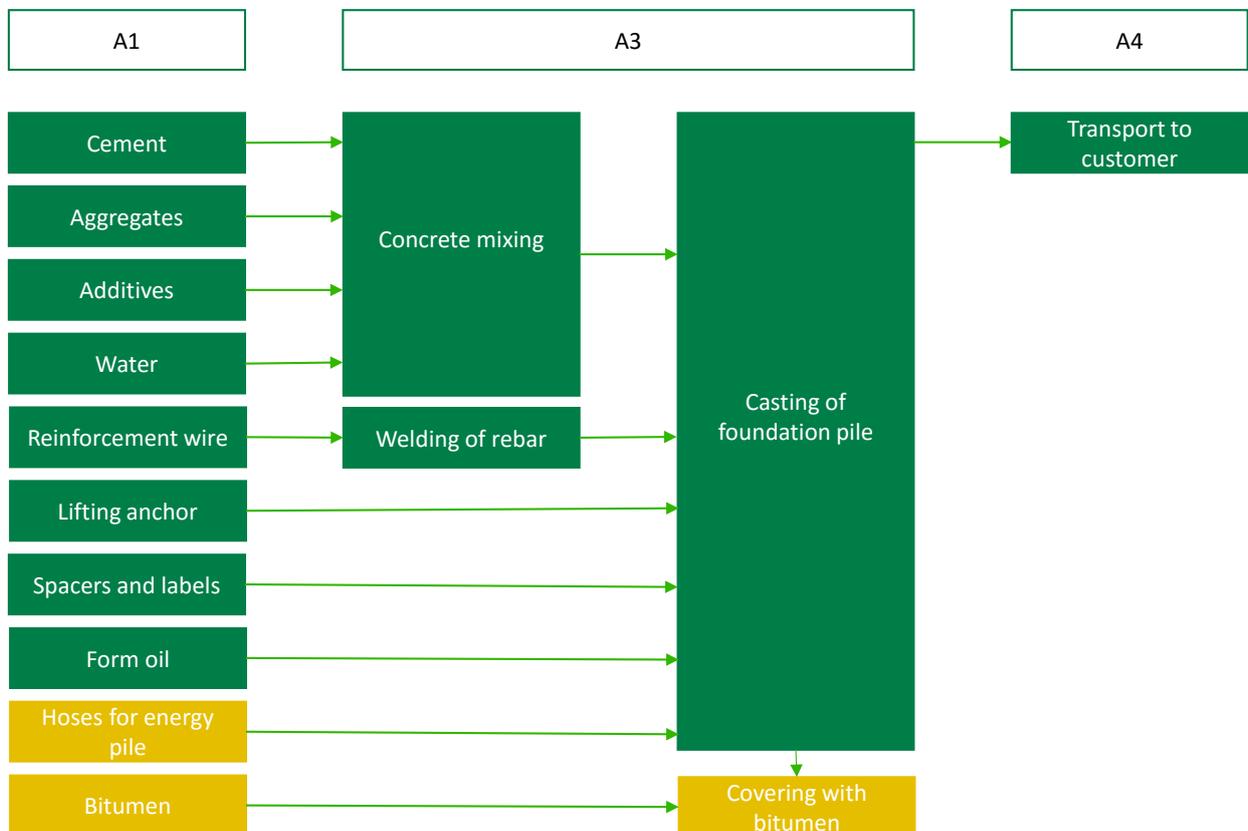
Not defined.

PCR

This environmental product declaration is based on the requirements of EN 15804:2012+A2:2019 and the product-specific PCR: "DS/EN 16757:2017 - "Sustainability in construction and construction - environmental product declarations - Product category rules for concrete and concrete elements".

Flow diagram

The flow diagram below covers raw materials (A1), production (A3) and outbound transport (A4) at Centrum Pæle in Vejle. Inbound and internal transport (A2) is done at the arrows. Yellow color indicates extensions.



System boundaries

The EPD is based on cradle-to-gate with options, module C1-C4 and module D. Options consist of including module A4.

All relevant processes from the modules covered are included.

The use phases (B2-B7) are of no relevance to the EPD as no contribution occurs as long as the product is installed in a given building/construction according to applicable instructions and standards.

The general rules for omitting inputs and outputs in the LCA follow the provisions of EN 15804:2012+A2:2019, 6.3.5, where the total omission of input flow per module may not exceed 5% of energy consumption and mass and a maximum of 1% per unit process.

Key assumptions are described for each life cycle stage below.

The product phase (A1-A3):

The product phase includes the provision of all raw materials, products and energy, transport to production, mixing process, internal transport and waste treatment up to "end-of-waste" or final disposal.

The LCA results are indicated in aggregated form of the product phase, which means that modules A1, A2 and A3 are considered as a single module A1-A3.

The foundation piles are made by mixing concrete and pouring into molds where the necessary reinforcement, casting parts etc. have been laid down according to current standards.

The molds are designed in steel and applied form oil to enable reuse after cleaning. The concrete elements are deformed the day after casting, after which they are driven to storage space. After hardening they are driven to the construction site.

Construction process phase (A4-A5):

The construction process phase includes transport from the factory gate to the construction site (by truck).

Installation of foundation piles (module A5) is not included but must be including in LCA calculations on complete building or installation.

Use phase (B1-B7):

Once foundation piles are installed according to applicable instructions and standards, there will be no need for maintenance, repairs, replacements, or renovation. Likewise, there is also no energy or water consumption associated with the product during the use phase.

Absorption of CO₂, as a result of carbonatization, is considered to be negligible since the entire product is buried without contact with air.

End of life (C1-C4) and potential for recycling, recycling and energy recovery (D):

The C and D modules are rated MNR as it is considered that there is no excavation of foundation piles in concrete with associated elements such as joints and rock shoes. All materials are inert in buried condition, and it will be associated with high energy consumption to excavate the elements. In addition, it is rare for built-up areas to be returned to natural condition, as these areas are usually redeveloped. When rebuilding, foundation piles can be included in the new construction if they are not damaged during demolition and data on the piles is known.

In this EPD, the piles are not considered recycled. Foundation piles left in the ground are specifically mentioned as examples in the PCR EN 16757:2017, chapter 6.3.8.4.2: "The EPD may specify a scenario whether no deconstruction/demolition or disposal takes place (e.g. disused underground foundation piles left without being exhumed)".

LCA results

For the calculation of LCIA results, the characterization model CML 2001 is used with GaBi 10.0 with database version 2020.0 for classifying and characterizing input and output flows.

Module A4 is indicated per kg of product per 100 km of transport. The results should therefore be multiplied by the weight of the product, as well as the distance relative to 100 km. Thus, for a product of 10 kg transported 200 km, all results must be multiplied by $10 \times 2 = 20$.

The results are given first for the main products and then for additions. Results for additions should be added to the results for the main products. For example, the addition of 2 sets of additional reinforcing bars (corresponding to change +2 in Type) should be added 2 times the results for "Type +/-1".

LCA results, main products

ENVIRONMENTAL IMPACTS PER METER										
Parameter	Unit	25x25 type 6	30x30 type 8	35x35 type 12	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ eq.]	2.59E+01	3.70E+01	5.08E+01	6.63E-03	0	0	0	0	0
GWP-fossil	[kg CO ₂ eq.]	2.58E+01	3.70E+01	5.07E+01	6.59E-03	0	0	0	0	0
GWP-bio	[kg CO ₂ eq.]	2.95E-02	3.83E-02	5.55E-02	-1.10E-05	0	0	0	0	0
GWP-luluc	[kg CO ₂ eq.]	1.64E-02	2.31E-02	3.20E-02	5.32E-05	0	0	0	0	0
ODP	[kg CFC 11 eq.]	3.47E-11	5.03E-11	6.84E-11	1.21E-18	0	0	0	0	0
AP	[mole H ⁺ eq.]	5.21E-02	7.42E-02	1.02E-01	7.47E-06	0	0	0	0	0
EP-fw	[kg PO ₄ eq.]	1.95E-05	2.71E-05	3.77E-05	2.00E-08	0	0	0	0	0
EP-mar	[kg N eq.]	1.65E-02	2.36E-02	3.24E-02	2.26E-06	0	0	0	0	0
EP-ter	[mole N eq.]	1.76E-01	2.52E-01	3.46E-01	2.70E-05	0	0	0	0	0
POCP	[kg NMVOC eq.]	4.86E-02	6.93E-02	9.52E-02	6.16E-06	0	0	0	0	0
ADP-mm ¹	[kg Sb eq.]	1.59E-06	2.20E-06	3.06E-06	5.32E-10	0	0	0	0	0
ADP-fos ¹	[MJ]	1.67E+02	2.34E+02	3.23E+02	8.78E-02	0	0	0	0	0
WDP ¹	[m ³]	1.86E+00	2.58E+00	3.60E+00	6.41E-05	0	0	0	0	0
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.									

ENVIRONMENTAL IMPACTS PER METER									
Parameter	Unit	40x40 type 12	45x45 type 16	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A4	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ eq.]	6.49E+01	8.22E+01	6.63E-03	0	0	0	0	0
GWP-fossil	[kg CO ₂ eq.]	6.48E+01	8.21E+01	6.59E-03	0	0	0	0	0
GWP-bio	[kg CO ₂ eq.]	5.76E-02	7.37E-02	-1.10E-05	0	0	0	0	0
GWP-luluc	[kg CO ₂ eq.]	3.96E-02	5.03E-02	5.32E-05	0	0	0	0	0
ODP	[kg CFC 11 eq.]	8.97E-11	1.14E-10	1.21E-18	0	0	0	0	0
AP	[mole H ⁺ eq.]	1.29E-01	1.64E-01	7.47E-06	0	0	0	0	0
EP-fw	[kg PO ₄ eq.]	4.55E-05	5.78E-05	2.00E-08	0	0	0	0	0
EP-mar	[kg N eq.]	4.14E-02	5.24E-02	2.26E-06	0	0	0	0	0
EP-ter	[mole N eq.]	4.42E-01	5.60E-01	2.70E-05	0	0	0	0	0
POCP	[kg NMVOC eq.]	1.21E-01	1.53E-01	6.16E-06	0	0	0	0	0
ADP-mm ¹	[kg Sb eq.]	3.66E-06	4.64E-06	5.32E-10	0	0	0	0	0
ADP-fos ¹	[MJ]	3.97E+02	5.03E+02	8.78E-02	0	0	0	0	0
WDP ¹	[m ³]	4.33E+00	5.51E+00	6.41E-05	0	0	0	0	0
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 IMPACTS PER METER										
Parameter	Unit	25x25 type 6	30x30 type 8	35x35 type 12	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D
PM	[Disease incidence]	6.53E-07	9.31E-07	1.28E-06	5.01E-11	0	0	0	0	0
IRP ²	[kBq U235 eq.]	1.68E+00	2.32E+00	3.25E+00	2.40E-05	0	0	0	0	0
ETP-fw ¹	[CTUe]	7.55E+01	1.06E+02	1.46E+02	6.57E-02	0	0	0	0	0
HTP-c ¹	[CTUh]	3.94E-09	5.55E-09	7.65E-09	1.36E-12	0	0	0	0	0
HTP-nc ¹	[CTUh]	4.32E-07	6.10E-07	8.43E-07	6.88E-11	0	0	0	0	0
SQP ¹	-	3.03E+01	4.21E+01	5.86E+01	3.08E-02	0	0	0	0	0
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 contingent 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.									

ADDITIONAL ENVIRONMENTAL IMPACTS PER METER										
Parameter	Unit	40x40 type 12	45x45 type 16	Transport per kg per 100 km	All types and dimensions					
		A1-A3	A1-A3	A4	C1	C2	C3	C4	D	
PM	[Disease incidence]	1.62E-06	2.06E-06	5.01E-11	0	0	0	0	0	0
IRP ²	[kBq U235 eq.]	3.87E+00	4.92E+00	2.40E-05	0	0	0	0	0	0
ETP-fw ¹	[CTUe]	1.82E+02	2.31E+02	6.57E-02	0	0	0	0	0	0
HTP-c ¹	[CTUh]	9.52E-09	1.21E-08	1.36E-12	0	0	0	0	0	0
HTP-nc ¹	[CTUh]	1.05E-06	1.33E-06	6.88E-11	0	0	0	0	0	0
SQP ¹	-	7.08E+01	8.99E+01	3.08E-02	0	0	0	0	0	0
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 contingent 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.									

RESOURCE CONSUMPTION PER METER										
Parameter	Unit	25x25 type 6	30x30 type 8	35x35 type 12	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D
PERE	[MJ]	3.43E+01	4.75E+01	6.61E+01	5.07E-03	0	0	0	0	0
PERM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
PERT	[MJ]	3.43E+01	4.75E+01	6.61E+01	5.07E-03	0	0	0	0	0
PENRE	[MJ]	1.67E+02	2.34E+02	3.23E+02	8.81E-02	0	0	0	0	0
PENRM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
PENRT	[MJ]	1.67E+02	2.34E+02	3.23E+02	8.81E-02	0	0	0	0	0
SM	[kg]	7.16E+00	9.43E+00	1.36E+01	0.00E+00	0	0	0	0	0
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
FW	[m ³]	6.11E-02	8.47E-02	1.18E-01	5.91E-06	0	0	0	0	0
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									

RESOURCE CONSUMPTION PER METER									
Parameter	Unit	40x40 type 12	45x45 type 16	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A4	C1	C2	C3	C4	D
PERE	[MJ]	7.95E+01	1.01E+02	5.07E-03	0	0	0	0	0
PERM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
PERT	[MJ]	7.95E+01	1.01E+02	5.07E-03	0	0	0	0	0
PENRE	[MJ]	3.97E+02	5.03E+02	8.81E-02	0	0	0	0	0
PENRM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
PENRT	[MJ]	3.97E+02	5.03E+02	8.81E-02	0	0	0	0	0
SM	[kg]	1.45E+01	1.86E+01	0.00E+00	0	0	0	0	0
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
FW	[m ³]	1.42E-01	1.80E-01	5.91E-06	0	0	0	0	0
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 METER										
Parameter	Unit	25x25 type 6	30x30 type 8	35x35 type 12	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D
HWD	[kg]	6.37E-04	9.24E-04	1.26E-03	4.07E-09	0	0	0	0	0
NHWD	[kg]	4.97E+00	7.21E+00	9.82E+00	1.40E-05	0	0	0	0	0
RWD	[kg]	1.04E-02	1.44E-02	2.02E-02	1.62E-07	0	0	0	0	0
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
MMR	[kg]	5.30E-01	7.60E-01	1.04E+00	0.00E+00	0	0	0	0	0
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
Caption	HWD = Hazardous waste disposal; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MMR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy									

WASTE CATEGORIES AND OUTPUT FLOWS PER METER									
Parameter	Unit	40x40 type 12	45x45 type 16	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A4	C1	C2	C3	C4	D
HWD	[kg]	1.65E-03	2.09E-03	4.07E-09	0	0	0	0	0
NHWD	[kg]	1.29E+01	1.63E+01	1.40E-05	0	0	0	0	0
RWD	[kg]	2.40E-02	3.06E-02	1.62E-07	0	0	0	0	0
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
MMR	[kg]	1.34E+00	1.69E+00	0.00E+00	0	0	0	0	0
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
Caption	HWD = Hazardous waste disposal; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MMR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy								

LCA results, additions

ENVIRONMENTAL IMPACTS PER METER											
Parameter	Unit	Bitumen, 25x25	Bitumen, 30x30	Bitumen, 35x35	Bitumen, 40x40	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ eq.]	5.85E-01	7.02E-01	8.19E-01	9.36E-01	6.63E-03	0	0	0	0	0
GWP-fossil	[kg CO ₂ eq.]	5.88E-01	7.06E-01	8.24E-01	9.41E-01	6.59E-03	0	0	0	0	0
GWP-bio	[kg CO ₂ eq.]	-4.66E-03	-5.60E-03	-6.53E-03	-7.46E-03	-1.10E-05	0	0	0	0	0
GWP-luluc	[kg CO ₂ eq.]	1.34E-03	1.60E-03	1.87E-03	2.14E-03	5.32E-05	0	0	0	0	0
ODP	[kg CFC 11 eq.]	1.02E-14	1.22E-14	1.42E-14	1.63E-14	1.21E-18	0	0	0	0	0
AP	[mole H ⁺ eq.]	1.46E-03	1.76E-03	2.05E-03	2.34E-03	7.47E-06	0	0	0	0	0
EP-fw	[kg PO ₄ eq.]	2.00E-06	2.40E-06	2.80E-06	3.20E-06	2.00E-08	0	0	0	0	0
EP-mar	[kg N eq.]	4.39E-04	5.26E-04	6.14E-04	7.02E-04	2.26E-06	0	0	0	0	0
EP-ter	[mole N eq.]	4.67E-03	5.60E-03	6.53E-03	7.47E-03	2.70E-05	0	0	0	0	0
POCP	[kg NMVOC eq.]	1.32E-03	1.58E-03	1.84E-03	2.11E-03	6.16E-06	0	0	0	0	0
ADP-mm ¹	[kg Sb eq.]	1.90E-07	2.28E-07	2.66E-07	3.04E-07	5.32E-10	0	0	0	0	0
ADP-fos ¹	[MJ]	1.87E+01	2.24E+01	2.61E+01	2.99E+01	8.78E-02	0	0	0	0	0
WDP ¹	[m ³]	6.04E-02	7.24E-02	8.45E-02	9.66E-02	6.41E-05	0	0	0	0	0
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.										

ENVIRONMENTAL IMPACTS PER METER											
Parameter	Unit	Bitumen, 45x45	Type +/- 1	Energy pile	Transport per kg per 100 km	All types and dimensions					
		A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D	
GWP-total	[kg CO ₂ eq.]	1.05E+00	4.47E-01	1.01E+00	6.63E-03	0	0	0	0	0	0
GWP-fossil	[kg CO ₂ eq.]	1.06E+00	4.42E-01	9.99E-01	6.59E-03	0	0	0	0	0	0
GWP-bio	[kg CO ₂ eq.]	-8.41E-03	4.33E-03	8.32E-03	-1.10E-05	0	0	0	0	0	0
GWP-luluc	[kg CO ₂ eq.]	2.41E-03	6.46E-04	8.19E-04	5.32E-05	0	0	0	0	0	0
ODP	[kg CFC 11 eq.]	1.83E-14	-5.86E-14	-1.45E-12	1.21E-18	0	0	0	0	0	0
AP	[mole H ⁺ eq.]	2.64E-03	1.23E-03	1.22E-03	7.47E-06	0	0	0	0	0	0
EP-fw	[kg PO ₄ eq.]	3.60E-06	1.07E-06	2.78E-06	2.00E-08	0	0	0	0	0	0
EP-mar	[kg N eq.]	7.90E-04	2.63E-04	1.69E-04	2.26E-06	0	0	0	0	0	0
EP-ter	[mole N eq.]	8.41E-03	2.84E-03	1.64E-03	2.70E-05	0	0	0	0	0	0
POCP	[kg NMVOC eq.]	2.37E-03	9.86E-04	1.27E-03	6.16E-06	0	0	0	0	0	0
ADP-mm ¹	[kg Sb eq.]	3.42E-07	1.00E-07	3.33E-07	5.32E-10	0	0	0	0	0	0
ADP-fos ¹	[MJ]	3.36E+01	7.16E+00	6.18E+01	8.78E-02	0	0	0	0	0	0
WDP ¹	[m ³]	1.09E-01	1.11E-01	4.66E-02	6.41E-05	0	0	0	0	0	0
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 IMPACTS PER METER											
Parameter	Unit	Bitumen, 25x25	Bitumen, 30x30	Bitumen, 35x35	Bitumen, 40x40	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D
PM	[Disease incidence]	1.27E-08	1.53E-08	1.78E-08	2.04E-08	5.01E-11	0	0	0	0	0
IRP ²	[kBq U235 eq.]	5.93E-02	7.12E-02	8.31E-02	9.50E-02	2.40E-05	0	0	0	0	0
ETP-fw ¹	[CTUe]	1.15E+01	1.38E+01	1.61E+01	1.84E+01	6.57E-02	0	0	0	0	0
HTP-c ¹	[CTUh]	3.08E-10	3.69E-10	4.31E-10	4.92E-10	1.36E-12	0	0	0	0	0
HTP-nc ¹	[CTUh]	1.07E-08	1.29E-08	1.50E-08	1.72E-08	6.88E-11	0	0	0	0	0
SQP ¹	-	4.77E+00	5.72E+00	6.67E+00	7.62E+00	3.08E-02	0	0	0	0	0
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 contingent 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.										

ADDITIONAL ENVIRONMENTAL IMPACTS PER METER											
Parameter	Unit	Bitumen, 45x45	Type +/- 1	Energy pile	Transport per kg per 100 km	All types and dimensions					
		A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D	
PM	[Disease incidence]	2.29E-08	1.43E-08	-2.19E-10	5.01E-11	0	0	0	0	0	
IRP ²	[kBq U235 eq.]	1.07E-01	1.12E-01	2.52E-02	2.40E-05	0	0	0	0	0	
ETP-fw ¹	[CTUe]	2.07E+01	2.42E+00	3.12E+01	6.57E-02	0	0	0	0	0	
HTP-c ¹	[CTUh]	5.54E-10	1.39E-10	7.29E-10	1.36E-12	0	0	0	0	0	
HTP-nc ¹	[CTUh]	1.93E-08	1.54E-08	2.28E-08	6.88E-11	0	0	0	0	0	
SQP ¹	-	8.58E+00	1.69E+00	4.09E+00	3.08E-02	0	0	0	0	0	
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 contingent 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.										

RESOURCE CONSUMPTION PER METER											
Parameter	Unit	Bitumen, 25x25	Bitumen, 30x30	Bitumen, 35x35	Bitumen, 40x40	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D
PERE	[MJ]	6.22E+00	7.46E+00	8.71E+00	9.95E+00	5.07E-03	0	0	0	0	0
PERM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
PERT	[MJ]	6.22E+00	7.46E+00	8.71E+00	9.95E+00	5.07E-03	0	0	0	0	0
PENRE	[MJ]	1.87E+01	2.24E+01	2.62E+01	2.99E+01	8.81E-02	0	0	0	0	0
PENRM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
PENRT	[MJ]	1.87E+01	2.24E+01	2.62E+01	2.99E+01	8.81E-02	0	0	0	0	0
SM	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
FW	[m ³]	3.78E-03	4.53E-03	5.29E-03	6.04E-03	5.91E-06	0	0	0	0	0
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										

RESOURCE CONSUMPTION PER METER										
Parameter	Unit	Bitumen, 45x45	Type +/- 1	Energy pile	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D
PERE	[MJ]	1.12E+01	2.02E+00	5.41E+00	5.07E-03	0	0	0	0	0
PERM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
PERT	[MJ]	1.12E+01	2.02E+00	5.41E+00	5.07E-03	0	0	0	0	0
PENRE	[MJ]	3.36E+01	7.16E+00	6.18E+01	8.81E-02	0	0	0	0	0
PENRM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
PENRT	[MJ]	3.36E+01	7.16E+00	6.18E+01	8.81E-02	0	0	0	0	0
SM	[kg]	0.00E+00	9.70E-01	1.64E-02	0.00E+00	0	0	0	0	0
RSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
FW	[m ³]	6.80E-03	3.63E-03	7.36E-03	5.91E-06	0	0	0	0	0
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 METER											
Parameter	Unit	Bitumen, 25x25	Bitumen, 30x30	Bitumen, 35x35	Bitumen, 40x40	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D
HWD	[kg]	6.26E-08	7.51E-08	8.77E-08	1.00E-07	4.07E-09	0	0	0	0	0
NHWD	[kg]	1.43E-02	1.71E-02	2.00E-02	2.29E-02	1.40E-05	0	0	0	0	0
RWD	[kg]	4.33E-04	5.20E-04	6.07E-04	6.93E-04	1.62E-07	0	0	0	0	0
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
MMR	[kg]	3.33E-02	3.99E-02	4.66E-02	5.32E-02	0.00E+00	0	0	0	0	0
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
Caption	HWD = Hazardous waste disposal; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MMR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy										

WASTE CATEGORIES AND OUTPUT FLOWS PER METER										
Parameter	Unit	Bitumen, 45x45	Type +/- 1	Energy pile	Transport per kg per 100 km	All types and dimensions				
		A1-A3	A1-A3	A1-A3	A4	C1	C2	C3	C4	D
HWD	[kg]	1.13E-07	-1.16E-06	-2.68E-05	4.07E-09	0	0	0	0	0
NHWD	[kg]	2.57E-02	-6.43E-03	-1.87E-01	1.40E-05	0	0	0	0	0
RWD	[kg]	7.80E-04	6.84E-04	3.00E-04	1.62E-07	0	0	0	0	0
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
MMR	[kg]	5.99E-02	7.31E-03	-1.32E-02	0.00E+00	0	0	0	0	0
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0	0	0
Caption	HWD = Hazardous waste disposal; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MMR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy									

Additional information

Technical information on underlying scenarios

Transport to the construction site (A4)

Name	Value	Unit
Fuel quantity and type (alternatively: type of transport)	Diesel	-
Transport types	<i>Truck trailer, Euro 6, 28 - 34t gross weight / 22t payload capacity</i>	
Transport distance	100	km
Capacity utilisation (including empty return journey)	61	%
Gross mass fill of transported product	2419 - 2434	kg/m ³
Capacity utilisation, volume factor	1	-

Reference service life

Name	Value	Unit
Reference Service Life - Lifetime RSL	100	Year
Declared product characteristics (at port) etc.	https://www.centrumpaele.dk/paele.aspx	-
Instructions for use (if given by the manufacturer)	https://www.centrumpaele.dk/statiske-beregninger.aspx	-
Presumed quality of installation work, according to manufacturer instructions	https://www.centrumpaele.dk/statiske-beregninger.aspx	-
Outdoor environment (outdoor use) – e.g. weather resistance, wind, pollution, UV, etc.	https://www.centrumpaele.dk/paele.aspx	-
Indoor environment (indoor use), e.g. temperature, humidity, etc.	<i>Not applicable</i>	-
Conditions of use - e.g. mechanical influences, frequency of use, etc.	https://www.centrumpaele.dk/statiske-beregninger.aspx	-
Maintain (frequency, type, quality, parts replacement)	<i>Not applicable</i>	-

End of life/Disposal (C1-C4)

Name	Value	Unit
Sorted construction waste	0	kg
Mixed construction waste	0	kg
For reuse	0	kg
For recycling	0	kg
For energy recovery	0	kg
For landfill	0	kg
Prerequisites for end-of-life scenarios	-	-

Recycling, recycling and/or recycling potential (D)

Name	Value	Unit
Displaced material	0	kg
Recycling potential	0	kg

Indoor air

Not applicable.

Soil and water

The EPD does not indicate anything about the release of hazardous substances to soil and water, as the horizontal standards for measuring the release of regulated hazardous substances from construction products using harmonised testing methods under the provisions of the respective Technical Committees for European Product Standards are not available.

References

Publisher	 www.epddanmark.dk
Program operator	Danish Technological Institute Gregersensvej DK-2630 Taastrup www.teknologisk.dk
LCA-practitioner	Danish Technological Institute Buildings & Environment Gregersensvej DK-2630 Taastrup www.teknologisk.dk
LCA software/background data	Thinkstep GaBi 10.0 Database version 2020.2 www.gabi-software.com
3rd Party Verifier	Ninkie Bendtsen NIRAS A/S Sortemosevej 19 DK-3450 Allerød www.niras.dk

General program instructions

Version 2.0
www.epddanmark.dk

EN 15804

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 16757:2017. Sustainability of construction works – Environmental product declarations – Product Category Rules for concrete and concrete elements.

EN 15942

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

ISO 14025

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

ISO 14040

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

ISO 14044

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