

Owner: Danish Fibres A/S
No.: MD-24134-EN
Issued: 29-10-2024
Valid to: 29-10-2029

3rd PARTY VERIFIED

EPD

VERIFIED ENVIRONMENTAL PRODUCT DECLARATION | ISO 14025 & EN 15804



Owner of declaration
 Danish Fibres A/S
 Snedkervej 1
 6800 Varde, Denmark
 VAT: 32321895



Issued:
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Valid to:
 29-10-2029

Programme
 EPD Danmark
www.epddanmark.dk



- Industry EPD
- Product EPD

Declared product(s)
 Wiking 4050 TR polypucks macro fibre

Number of declared datasets/product variations: 1

Production site
 Snedkervej 1
 6800 Varde, Denmark

- Use of Guarantees of Origin**
- No certificates used
 - Electricity covered by GoO
 - Biogas covered by GoO

Declared/ functional unit
 1 kg polypropylene macro fibre

Year of production site data (A3)
 2023

EPD version
 First, August 2024

Basis of calculation

This EPD is developed and verified 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:



Mie Ostenfeldt
 Ostenfeldt Consulting



Martha Katrine Sørensen
 EPD Danmark

Life cycle stages and modules (ND = 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 | ND | ND | ND | ND | ND | ND | ND | ND | ND | X | X | X | X | X | |

Product information

Product description

The main product components for 1 kg Wiking 4050 TR PolyPucks are shown in the table below.

| Material | Weight-% of declared product |
|---------------|------------------------------|
| Polypropylene | 100 % |

Product packaging:

The fibres are wrapped in foil, cut and small portions packed in bags. Several bags are packed in large cardboard boxes and wrapped in a plastic film and loaded on EUR-pallets. The composition of the sales- and transport packaging of the product per functional unit is shown in the table below.

| Material | Weight of packaging material (kg) | Weight-% of packaging |
|---------------|-----------------------------------|-----------------------|
| PE bag | 0,049 | 70% |
| Cardboard box | 0,017 | 24% |
| Wooden pallet | 0,001 | 1% |
| PP film | 0,002 | 3% |
| PVA film | 0,001 | 1% |
| Paper label | 0,0002 | 0% |
| Total | 0,0524 | |

Representativity

This declaration, including data collection and the modeled foreground system with results, represents the production of Wiking 4050 SP macro fibres on the production site located in Varde, Denmark. Product specific data are based on average values collected for the year 2023. Background data are based on Ecoinvent 3.10 2024.1 and Sphera MLC 2024 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.

The products are manufactured in Denmark and mainly sold in Denmark and a smaller fraction in Germany. Therefore, a Danish EoL scenario is included.

Hazardous substances

Wiking 4050 TR PolyPucks does not contain substances listed on the "Candidate List of Substances of Very High Concern for authorisation"

(<http://echa.europa.eu/candidate-list-table>)

Product(s) use

The fibres are high-performance fibres for concrete reinforcement. Therefore, they are mixed with concrete before its installation. They are applicable in industrial floor and shotcrete surfaces to prevent crack formation and give post cracking tensile strength.

Essential characteristics

The fibres are macrofibres made of polypropylene and a fibre lengths of 48 mm.

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

<https://danishfibres.com/>

Reference Service Life (RSL)

The reference service life is not defined as the use-phase is not included in the study.

Picture of product(s)

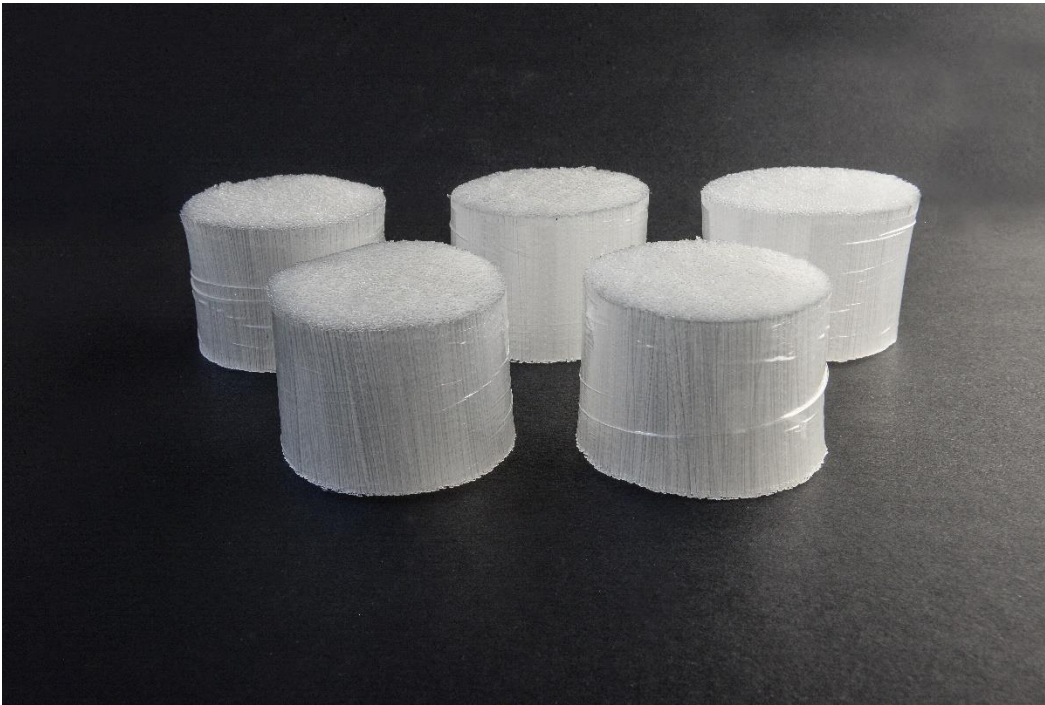


Figure 1. Wiking 4050 TR PolyPucks wrapped in foil.

LCA background

Declared unit

The LCI and LCIA results in this EPD relates to the declared unit of 1 kg fibres as stated in the table below.

| Name | Value | Unit |
|----------------------------|-------|-------------------|
| Declared unit | 1 | kg |
| Density | 910 | kg/m ³ |
| Conversion factor to 1 kg. | 1 | - |

Functional unit

Not defined.

PCR

This EPD is developed according to the core rules for the product category of construction products in EN 15804+A2.

Energy modelling principles

Foreground system:

The product is produced using the Danish grid mix and is modelled using the Danish residual grid mix.

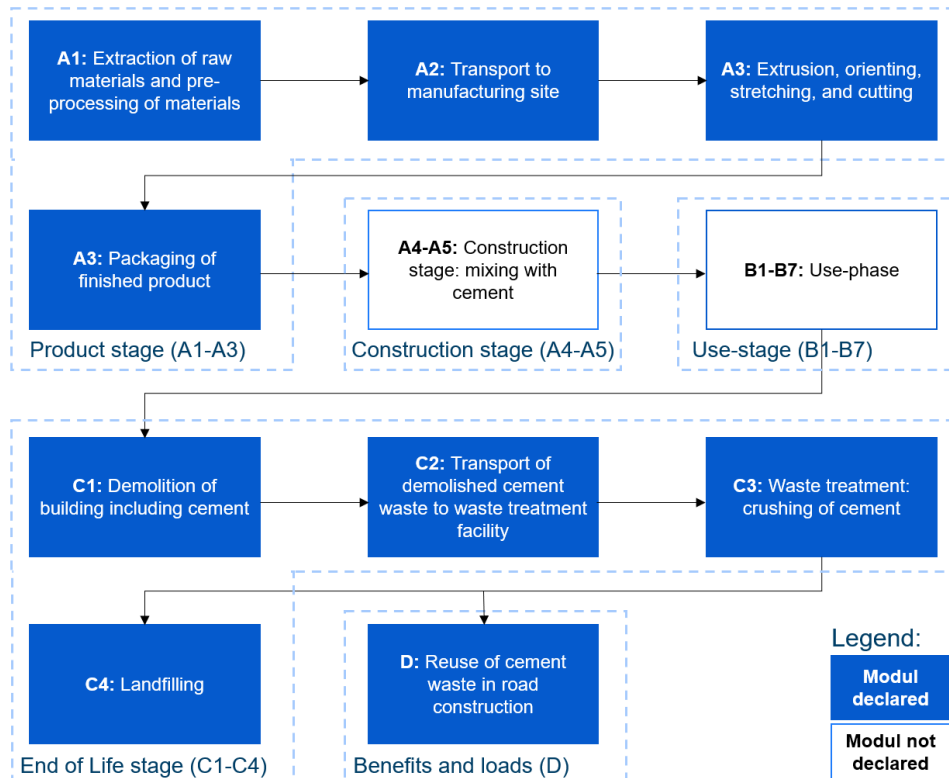
Information about the energy mix in the foreground system:

| Dataset | EF | Unit |
|---|-------|--------------------------|
| Electricity, residual mix, DK, ref. year 2023 | 0,648 | kg CO _{2e} /kWh |
| Heat from natural gas, Europe without Switzerland, ref. year 2023 | 0,078 | kg CO _{2e} /MJ |
| District heating, Europe without Switzerland, ref. year 2023 | 0,056 | kg CO _{2e} /MJ |

Background system:

Upstream processes are modelled using consumption mix. Downstream processes are modelled using residual grid mix

Flowdiagram



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. The incoming packaging of raw materials fall under the cut-off criteria and is excluded from the model.

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 for the fibres are transported from the suppliers to the production facility in Varde, Denmark. The suppliers are located in Sweden and Denmark. The polypropylene granulate is melted and the fibres produced through plastic extrusion. The fibres are then stretched and cooled in a water bath. Before cutting, the fibres are wrapped in foil to retrieve a high density for transportation. The wrapped and cut fibres are further packed in small bags and several bags are packed in cardboard box.

End of Life (C1-C4) includes:

At the End-of-Life stage, the fibres are part of a concrete structure and cannot be separated. The concrete including the fibres is demolished and excavated (C1). Next, the concrete is transported to the waste processing site (C2) where it is crushed to gravel size (C3). This EPD assumes that 97% of the crushed concrete including the fibres is recycled (D) and the remaining 3% is disposed in landfill (C4).

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

The fibre in the crushed concrete is being used as road filling as a substitution for gravel. It is assumed that 1 kg fibres can replace 0,7 kg gravel for road filling. As 97 % of the fibres are recycled, 0,68 kg gravel is substituted.

LCA results

| ENVIRONMENTAL IMPACTS PER KG | | | | | | | |
|------------------------------|---|-----------|----------|----------|----------|----------|-----------|
| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
| GWP-total | [kg CO ₂ eq.] | 3,39E+00 | 1,49E-03 | 1,52E-02 | 1,17E-03 | 1,88E-04 | -4,82E-03 |
| GWP-fossil | [kg CO ₂ eq.] | 3,39E+00 | 1,49E-03 | 1,52E-02 | 1,17E-03 | 1,88E-04 | -4,73E-03 |
| GWP-biogenic | [kg CO ₂ eq.] | -9,12E-04 | 1,42E-06 | 1,05E-05 | 1,01E-06 | 2,59E-08 | -9,10E-05 |
| GWP-luluc | [kg CO ₂ eq.] | 1,58E-03 | 2,95E-07 | 5,05E-06 | 2,16E-07 | 9,66E-08 | -2,28E-06 |
| ODP | [kg CFC 11 eq.] | 1,24E-07 | 9,53E-11 | 3,02E-10 | 6,73E-11 | 5,43E-12 | -7,56E-11 |
| AP | [mol H ⁺ eq.] | 1,03E-02 | 8,08E-06 | 3,17E-05 | 6,84E-06 | 1,33E-06 | -3,01E-05 |
| EP-freshwater | [kg P eq.] | 7,58E-04 | 7,84E-08 | 1,03E-06 | 5,99E-08 | 1,56E-08 | -6,44E-07 |
| EP-marine | [kg N eq.] | 2,12E-03 | 2,59E-06 | 7,61E-06 | 2,39E-06 | 5,07E-07 | -9,85E-06 |
| EP-terrestrial | [mol N eq.] | 2,16E-02 | 2,81E-05 | 8,21E-05 | 2,60E-05 | 5,53E-06 | -1,23E-04 |
| POCP | [kg NMVOC eq.] | 1,55E-02 | 1,57E-05 | 5,26E-05 | 1,27E-05 | 1,98E-06 | -3,52E-05 |
| ADPm ¹ | [kg Sb eq.] | 2,38E-05 | 9,09E-10 | 4,95E-08 | 6,86E-10 | 2,93E-10 | -4,16E-08 |
| ADPf ¹ | [MJ] | 1,46E+01 | 1,41E-03 | 1,78E-02 | 1,08E-03 | 2,85E-04 | -1,73E-02 |
| WDP ¹ | [m ³ world eq. deprived] | 1,27E+00 | 6,86E-05 | 8,88E-04 | 5,18E-05 | 2,01E-04 | -8,46E-04 |
| Caption | GWP-total = Globale Warming Potential - total; GWP-fossil = Global Warming Potential - fossil fuels; GWP-biogenic = 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 depletion potential | | | | | | |
| | The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 ² or 195, while 1,12E-11 is the same as 1,12*10 ⁻¹¹ or 0,0000000000112. | | | | | | |
| 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, as declared in the project report of this EPD:

| ADDITIONAL ENVIRONMENTAL IMPACTS PER KG | | | | | | | |
|---|--|----------|----------|----------|----------|----------|-----------|
| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
| PM | [Disease incidence] | 7,90E-08 | 1,56E-10 | 1,12E-09 | 1,45E-10 | 3,02E-11 | -6,69E-10 |
| IRP ² | [kBq U235 eq.] | 2,77E-01 | 3,05E-05 | 2,77E-04 | 2,23E-05 | 2,93E-06 | -5,87E-04 |
| ETP-fw ¹ | [CTUe] | 1,17E+01 | 4,18E-03 | 5,82E-02 | 3,23E-03 | 6,29E-04 | -3,57E-02 |
| HTP-c ¹ | [CTUh] | 1,10E-08 | 7,33E-12 | 1,08E-10 | 6,01E-12 | 8,47E-13 | -7,53E-11 |
| HTP-nc ¹ | [CTUh] | 2,69E-08 | 5,72E-12 | 1,34E-10 | 4,18E-12 | 7,86E-13 | -5,43E-11 |
| SQP ¹ | - | 1,03E+01 | 3,87E-03 | 1,29E-01 | 2,76E-03 | 9,05E-03 | -9,93E-02 |
| 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) | | | | | | |
| | The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 ² or 195, while 1,12E-11 is the same as 1,12*10 ⁻¹¹ or 0,0000000000112. | | | | | | |
| 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. | | | | | | |

| RESOURCE USE PER KG | | | | | | | |
|---------------------|---|----------|----------|----------|----------|----------|-----------|
| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
| PERE | [MJ] | 2,10E+00 | 2,71E-04 | 2,84E-03 | 2,00E-04 | 3,13E-05 | -1,06E-02 |
| PERM | [MJ] | 8,38E-01 | 5,55E-05 | 8,36E-04 | 4,13E-05 | 1,18E-05 | -2,90E-03 |
| PERT | [MJ] | 2,93E+00 | 3,26E-04 | 3,68E-03 | 2,41E-04 | 4,31E-05 | -1,35E-02 |
| PENRE | [MJ] | 1,40E+01 | 1,41E-03 | 1,78E-02 | 1,08E-03 | 2,85E-04 | -1,73E-02 |
| PENRM | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| PENRT | [MJ] | 1,40E+01 | 1,41E-03 | 1,78E-02 | 1,08E-03 | 2,85E-04 | -1,73E-02 |
| SM | [kg] | 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 |
| NRSF | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| FW | [m³] | 3,22E-02 | 2,55E-06 | 2,96E-05 | 1,90E-06 | 4,79E-06 | -2,66E-04 |
| 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 | | | | | | |
| | The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 ² or 195, while 1,12E-11 is the same as 1,12*10 ⁻¹¹ or 0,0000000000112. | | | | | | |

| WASTE CATEGORIES AND OUTPUT FLOWS PER KG | | | | | | | |
|--|---|----------|----------|----------|----------|----------|-----------|
| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
| HWD | [kg] | 1,61E-03 | 4,24E-07 | 1,44E-06 | 3,00E-07 | 2,91E-08 | -4,67E-07 |
| NHWD | [kg] | 1,93E-01 | 2,63E-05 | 1,03E-02 | 1,94E-05 | 3,00E-02 | -2,45E-03 |
| RWD | [kg] | 6,91E-05 | 7,56E-09 | 6,89E-08 | 5,52E-09 | 7,15E-10 | -1,36E-07 |
| CRU | [kg] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| MFR | [kg] | 1,00E-01 | 0,00E+00 | 0,00E+00 | 6,79E-01 | 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 |
| EEE | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| EET | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Caption | HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy | | | | | | |
| | The numbers are declared in scientific notation, fx 1,95E+02. This number can also be written as: 1,95*10 ² or 195, while 1,12E-11 is the same as 1,12*10 ⁻¹¹ or 0,0000000000112. | | | | | | |

| BIOGENIC CARBON CONTENT PER KG | | |
|---|---|---------------------|
| Parameter | Unit | At the factory gate |
| Biogenic carbon content in product | [kg C] | 0,00 |
| Biogenic carbon content in accompanying packaging | [kg C] | 0,0075 |
| Note | 1 kg biogenic carbon is equivalent to 44/12 kg of CO ₂ | |

Additional information

LCA interpretation

The raw material extraction and processing (A1) module is dominating the impact results across all core environmental indicators. This is linked to the production of polypropylene, the main raw material of the fibre. The second most impactful module is the manufacturing of the product (A3).

Technical information on scenarios

End of life (C1-C4)

| Scenario information | Value | Unit |
|--------------------------------------|-------|----------------|
| Collected separately | 1 | kg |
| Collected with mixed waste | - | kg |
| For reuse | - | kg |
| For recycling | 0,97 | kg |
| For energy recovery | - | kg |
| For final disposal | 0,03 | kg |
| Assumptions for scenario development | - | As appropriate |

Re-use, recovery and recycling potential (D)

| Scenario information/Materiel | Value | Unit |
|---|-------|-------|
| Substitution of gravel for road filling | 0,68 | Kg/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

| | |
|--|--|
| <p>Publisher</p> | <p> epddanmark</p> <p>www.epddanmark.dk <small>Template version 2024.1</small></p> |
| <p>Programme operator</p> | <p>Danish Technological Institute Gregersensvej DK-2630 Taastrup www.teknologisk.dk</p> |
| <p>LCA-practitioner</p> | <p>Nele Teutloff Charlotte Merlin</p> <p></p> <p>FORCE Technology Park Allé 345 2605 Brøndby www.forcetechnology.com</p> |
| <p>LCA software / background data</p> | <p>Ecoinvent 3.10 (www.ecoinvent.org) EN 15804 reference package 3.1</p> |
| <p>3rd party verifier</p> | <p>Mie Ostenfeldt</p> <p>Ostenfeldt Consulting http://ostenfeldtconsulting.dk</p> <p></p> |

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"