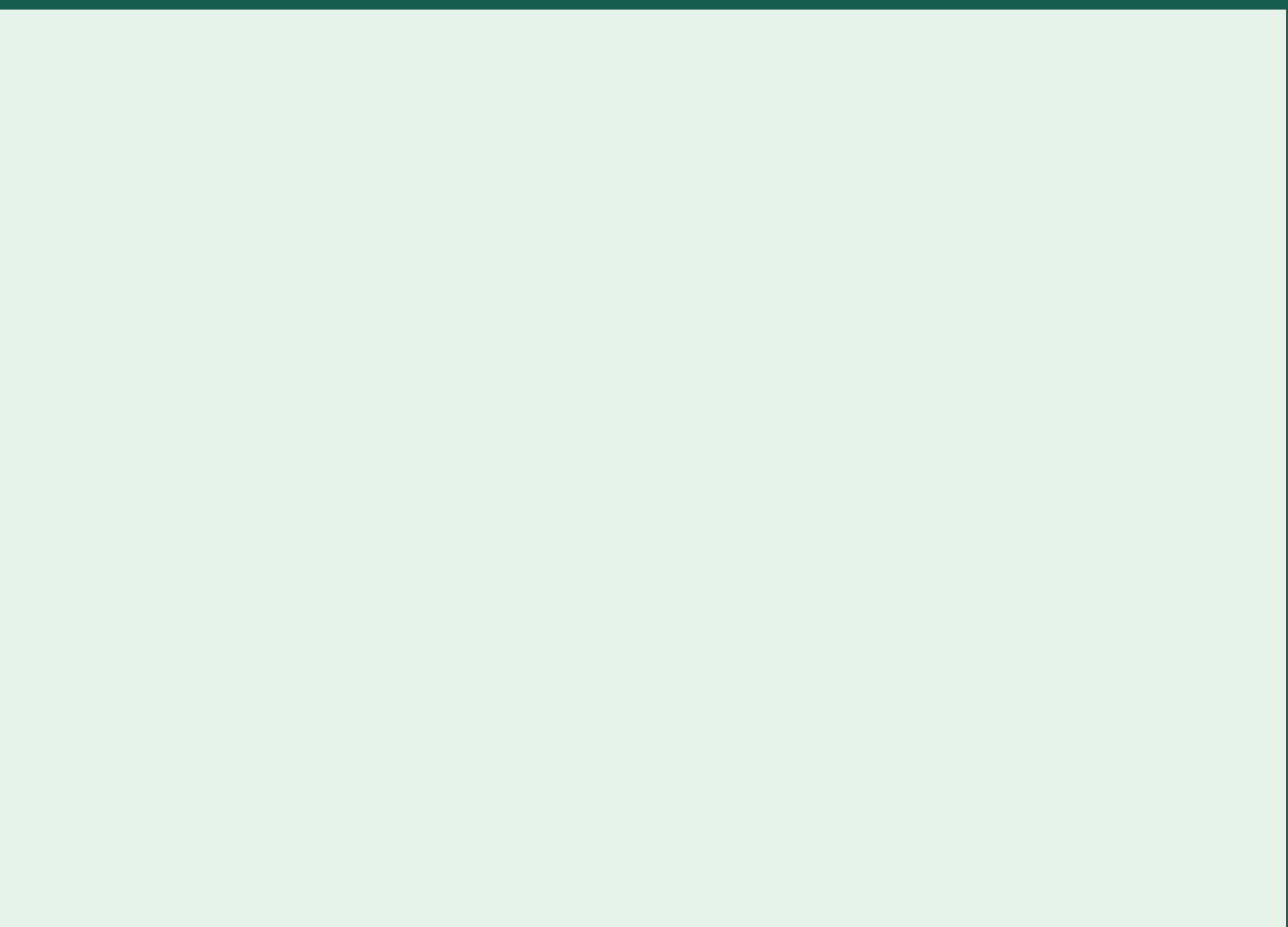


# Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 +A2



The Norwegian  
EPD Foundation

**Owner of the declaration:**  
Nordisk Perlite ApS

**Program holder and publisher:**  
The Norwegian EPD foundation

**Declaration number:**  
[Number]

**Registration Number:**  
[Number]

**Issue date:** [Date]  
**Valid to:** [Date]

**Product name**

Perlite building insulation

**Manufacturer**  
Nordisk Perlite ApS

# General information

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## Product:

Perlite Expand 0515 SC, 0530 SC and 0560 SC

## Program Operator:

The Norwegian EPD Foundation  
Post Box 5250 Majorstuen, 0303 Oslo, Norway  
Tlf: +47 23 08 80 00  
e-mail: [post@epd-norge.no](mailto:post@epd-norge.no)

## Declaration Number:

[From EPD-Norge]

## This declaration is based on Product

### Category Rules:

EN 15804:2012+A2:2019 and c-PCR EN 16783

## Statements:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer, life cycle assessment data and evidences.

## Declared unit:

1 m<sup>3</sup> of expanded perlite

## Declared unit with option:

1 m<sup>3</sup> of expanded perlite

A1-A5, B1-B7, C1-C4 and D

## Functional unit:

1 m<sup>3</sup> of expanded perlite with bulk density 85 kg/m<sup>3</sup> with insulation value of 0,042 W/m.K

## Verification:

Independent verification of the declaration and data, according to ISO14025:2010

internal

external

Sign

[name]

Independent verifier approved by EPD Norway

## Owner of the declaration:

Nordisk Perlite ApS

Contact person:

Cees Vader

Phone:

0045 31170584

e-mail:

[cees@nordiskperlite.dk](mailto:cees@nordiskperlite.dk)

## Manufacturer:

Nordisk Perlite ApS

Hammersholt Erhvervspark 1-5

DK-3400 Hillerød, Denmark

Phone:

+45 48 14 07 22

e-mail:

[nordisk@perlite.dk](mailto:nordisk@perlite.dk)

## Place of production:

Hammersholt, Denmark

## Management system:

ISO 9001

## Organisation no:

DK48247717

## Issue date:

[xx.xx.xxxx]

## Valid to:

[xx.xx.xxxx]

## Year of study:

2021

## Comparability:

EPDs from other programmes than [Name of Program operator] may not be comparable.

## The EPD has been worked out by:

Amy Stockwell, Eando AB

[amy.stockwell@eando.se](mailto:amy.stockwell@eando.se)



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Approved (Manager of EPD Norway)

# Product

## Product description:

Norlite Perlite 0515 SC, 0530 SC and 0560 SC are expanded perlite aggregates. The raw perlite is expanded 10 – 15 times in size in a furnace, at 1000°C, driven by natural gas. All SC-products are coated with a special water-proof membrane, preventing water and humidity from penetrating and have a capillary breaking height of 4 cm. Nordisk Perlite produces 3 different particle sizes, that all can be used for thermal insulation, with a value of 0.042 W/m.K. Norlite Perlite 0515 SC, 0530 SC and 0560 SC is a loose fill insulation tested according to DS/EN 12667:2001 and DS/EN 15501:2013. Other applications are light weight hydrophobic filler and selective absorber of oils.

Norlite Perlite 0515 SC, 0530 SC and 0560 SC has 0 % VOC as the product exists of a mineral with a polymeric coating; the polymeric siloxane is chemically bound to the perlite mineral. Norlite Perlite 0515 SC, 0530 SC and 0560 SC does not need a safety datasheet as the product has no health and safety sentences. It is therefore safe to use for all applications.

Norlite Perlite 0515 SC, 0530 SC and 0560 SC is used among others for floor separations and shows noise absorption properties and forms a natural fire-proof layer, A1 in fire-class in all applications. Norlite Perlite 0515 SC, 0530 SC and 0560 SC are among the lightest mineral aggregates on the market.

Correctly installed Norlite Perlite 0515 SC, 0530 SC and 0560 SC will last forever as insulation material as the products do not absorb water, are heat-, cold- and dimension-stable.

## Product specification:

Norlite Perlite 0515 SC, 0530 SC and 0560 SC are produced by expanding raw perlite with natural gas in a furnace, hereafter the expanded grades 0515, 0530 and 0560 are treated with a siloxane and become the hydrofobic grades 0515 SC, 0530 SC and 0560 SC. Norlite Perlite 0515 SC, 0530 SC and 0560 SC are REACH exempt.

| Materials | kg per m <sup>3</sup> | %           |
|-----------|-----------------------|-------------|
| Perlite   | 84.75 – 84.83         | 99.7 – 99.8 |
| Siloxane  | 0.17 – 0.25           | 0.2 – 0.3   |

## Technical data:

Norlite Perlite Expand comes in 3 sizes: 0515 SC (0,5-1,5 mm), 05 30 SC (0,5 – 3,0 mm) and 05 60 SC (0,5 -6,0 mm). All have a bulk density of 85 kg/m<sup>3</sup> and an insulation value of 0.042 W/m.K

## Market:

Europe

## Reference service life, product:

Equal to the building service life, of at least 50 years.

## Reference service life, building:

Equal to the building service life

# LCA: Calculation rules

## Declared unit:

1m<sup>3</sup> of siloxane coated expanded perlite for building insulation, including A1-A5, B1-B7, C1-C4 and D.

## Data quality:

The manufacturing process A3 is based on specific 2021 total production data obtained from Nordisk Perlite. Transportation data A2 was also provided by Nordisk Perlite. Some data was provided from a Turkish perlite mine, which was inserted into the Ecoinvent perlite quarry operation dataset. Other raw materials in A1 use generic data from GaBi datasets shown in the LCA scenarios section.

## Allocation:

No allocation was required for the manufacturing of perlite. All expanded perlite is sold in a variety of formats. For example fine powder, which cannot be used for insulation or filtration, is used as sterile floor coating for cattle sheds. The energy required for coating is recorded separately to that of expansion, so no allocation required.

## System boundary:

All life cycle stages are included in the study: product stage (A1-A3), construction process (A4-A5), end of life (module C) and module D. Module B is not associated with any activities or emissions causing any environmental impacts.

|                 | Product stage |           |               | Assembly stage |          | Use stage |             |        |             |               |                        |                       | End of life stage          |           |                  |          | Benefits & loads beyond system boundary |
|-----------------|---------------|-----------|---------------|----------------|----------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|----------|-----------------------------------------|
|                 | Raw materials | Transport | Manufacturing | Transport      | Assembly | Use       | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling-potential      |
| Module          | A1            | A2        | A3            | A4             | A5       | B1        | B2          | B3     | B4          | B5            | B6                     | B7                    | C1                         | C2        | C3               | C4       | D                                       |
| Module declared | X             | X         | X             | X              | X        | X         | X           | X      | X           | X             | X                      | X                     | X                          | X         | X                | X        | X                                       |
| Geography       | TR/EU         | EU        | DK            | DK             | DK       | ND        | ND          | ND     | ND          | ND            | ND                     | ND                    | DK                         | DK        | DK               | DK       | DK                                      |

### *A1, raw material supply*

This module considers the extraction and processing of all raw materials, energy, and transportation which occur upstream to the studied manufacturing process, including packaging material (except for ancillary material used in product manufacturing process).

### *A2, transport to the manufacturer*

The raw materials are transported to the manufacturing site. This also includes coatings and packaging material.

### *A3, manufacturing*

This module includes manufacturing of expanded perlite and the coating of it for the following products:

Norlite Perlite Expand 0515 SC

Norlite Perlite Expand 0530 SC

Norlite Perlite Expand 0560 SC

### *A4-A5 Construction process stage*

#### *A4, Transport*

Transportation from Nordisk Perlite to the building site is taken into account.

#### *A5, Construction installation*

This stage includes any resources used during the installation of the product on the construction site. In this case the insulation can either be installed manually (no emissions) or by blower. Waste is negligible as perlite does not need to be cut into shape. 1% waste was assumed as spillage and dust and that it would be in too small quantities to be recycled. Treatment of the packaging waste on site is considered and assumes average Danish end of life rates for mixed construction waste.

### *B Use stage*

#### *B1-B7*

This stage includes no activities or emissions related to the product.

### *C End of life stage*

Norlite Perlite 0515 SC, 0530 SC and 0560 SC can be re-used, either as insulation, with the same properties as virgin perlite, or be used in concrete as light weight filler.

#### *C1 Deconstruction/Demolition*

Norlite Perlite 0515 SC, 0530 SC and 0560 SC can easily be collected by gathering the material in big bags through suction. This requires the same amount of energy and same type of equipment as to install the perlite. Therefore the values of C1 are the same as under A5. Of course other methods to gather Norlite Perlite 0515 SC, 0530 SC and 0560 SC can be used, but these are not documented in this EPD. It is assumed that all perlite will be collected for reuse.

#### *C2 Transport*

Transport distance to waste processing.

#### *C3 Waste processing*

None. All Norlite Perlite can be reused in section D.

#### *C4 Final disposal*

None. All Norlite Perlite can be reused in section D.

### *D Benefits and loads beyond the system boundary*

Emission credits are obtained from the reuse of perlite as a concrete filler, at the end of the life of the building.

At the manufacturing phase heat energy is recovered and used as local heating. It is assumed to be a substitute for thermal energy from natural gas. Much of the packaging is made from mono-materials which can be recycled and credited here.

### Cut-off criteria:

All input and output flows in a unit process were considered i.e., taking into account the value of all flows in the unit process and the corresponding LCI where data was available. Data gaps were filled by conservative assumptions with average or generic data. Any assumptions in such case were documented. The use of cut-off criterion on mass inputs and primary energy at the unit process level (1%) and at the information module level (5%).

## LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

### Raw materials: perlite mining and siloxane (A1)

Some data was provided from the Turkish perlite mines. This was inserted into the Ecoinvent dataset on perlite quarry operation.

| Materials                                   | Source        | Data quality | Year              | Geography |
|---------------------------------------------|---------------|--------------|-------------------|-----------|
| Diesel, mix at filling station              | Sphera        | Database     | 2018              | EU28      |
| Electricity, high voltage production mix    | Ecoinvent 3.8 | Database     | 2018              | TR        |
| Lubricants at refinery                      | Sphera        | Database     | 2018              | EU28      |
| Market for mine infrastructure, vermiculite | Ecoinvent 3.8 | Database     | 2011              | GLO       |
| Perlite quarry operation                    | Ecoinvent 3.8 | Database     | 2000 with updates | DE        |
| Polydimethylsiloxane, market for            | Ecoinvent 3.8 | Database     | 2015              | GLO       |
| Tap water from ground water                 | Sphera        | Database     | 2020              | EU28      |
| Thermal energy from heavy fuel oil          | Sphera        | Database     | 2018              | GR        |

The mine infrastructure dataset is old, but there is no other data available. Analysis was completed to show its impact on the total environmental impact was negligible (maximum of 0.28%) for all of the main impact indicators.

### Transport from production place to assembly/user (A4)

| Type  | Capacity utilisation % | Type of vehicle                | Distance km | Fuel/Energy consumption |
|-------|------------------------|--------------------------------|-------------|-------------------------|
| Truck | 28%                    | Truck trailer with 27t payload | 250         | 0.0167 kg/tkm           |

This distance is estimated based on knowledge of consumer locations. Perlite once expanded is a very low density at 85 kg/m<sup>3</sup>, so one truck can carry only 7.65 tonnes, which is unusually low.

| Fuel type                             | Source | Data quality | Year |
|---------------------------------------|--------|--------------|------|
| EU 28: Diesel mix (6,35% bio-content) | Sphera | Database     | 2017 |

## Assembly (A5)

|                         | Unit | Value /m <sup>3</sup> |
|-------------------------|------|-----------------------|
| Electricity consumption | kWh  | 0.018                 |
| Material loss           | %    | 1                     |

Perlite can either be installed manually (no energy required) or by blow machine. The same amount of waste is assumed for each.

## Use Stage(B)

B1-B7: Perlite is stable and inert. Therefore there are no environmental impacts expected in the use phase and no harmful substances are released to air, water or ground during the use of the product.

## End of Life (C1, C3, C4)

Norlite Perlite 0515 SC, 0530 SC and 0560 SC can be re-used, either as insulation, showing the same parameters as new product, or be used in concrete as light weight filler. The method to remove Norlite Perlite 0515 SC, 0530 SC and 0560 SC we have chosen to document in this EPD is to gather the material in big bags through suction. This requires the same amount of energy and same type of equipment as to install the perlite by blowing it in place. Therefore the values of C1 are the same as under A5. Of course other methods to gather Norlite Perlite 0515 SC, 0530 SC and 0560 SC can be used, but these are not documented in this EPD.

As Nordisk Perlite we work for circular economic products. This criteria Norlite Perlite 0515 SC, 0530 SC and 0560 SC can fulfill by reuse or use as light weight filler in concrete. Therefore no disposal is considered.

## Transport to waste processing (C2)

| Type  | Capacity utilisation (incl. return) % | Type of vehicle | Distance km | Fuel/Energy consumption |
|-------|---------------------------------------|-----------------|-------------|-------------------------|
| Truck | 61%                                   | Truck trailer   | 100         | 0.0167 kg/tkm           |

Transportation distance to waste processing facility is assumed to be 100km

## Benefits and loads beyond the system boundaries (D)

Norlite Perlite 0515 SC, 0530 SC and 0560 SC can be reused, fulfilling the circular economic criteria of using the product as intended when producing the virgin product, we have a cradle-to-cradle application.

Norlite Perlite 0515 SC, 0530 SC and 0560 SC can be used as light weight filler in concrete. A known problem in the concrete industry is the need for light and good quality aggregates. As it might not be possible to reuse Norlite Perlite 0515 SC, 0530 SC and 0560 SC as insulation in all cases, we have documented this solution. Concrete cubes were made according to DS/EN 206-9 NA : 5 cubes per formulation of Concrete 35. In the table below, the average results are presented. Weight reduction can be achieved, but the strength of the concrete should be observed. Larger amounts of Norlite Perlite 05 15 SC, 05 30 SC and 05 60 SC can be added to concrete, but this was not tested at the time. It is therefore assumed that concrete can be replaced by perlite on a 1:1 weight basis.

| Sample                                        | Compressive Strength (kN) | Compressive Strength (MPa) | Weight Cube (kg) | Density (kg/m <sup>3</sup> ) |
|-----------------------------------------------|---------------------------|----------------------------|------------------|------------------------------|
| Concrete 35 reference                         | 772                       | 34.31*                     | 7.22             | 2139                         |
| Concrete 35 + 0,1 % Norlite Perlite 05 60 SC  | 628                       | 27.91                      | 7.20             | 2131                         |
| Concrete 35 + 0,25 % Norlite Perlite 05 60 SC | 568                       | 25.24                      | 6.96             | 2062                         |

As noted in section A3, waste heat is used as district heating for which there is credit. Recycled and incinerated packaging materials also gain credits here.

| Per m <sup>3</sup> perlite                                         | Unit | Value |
|--------------------------------------------------------------------|------|-------|
| Waste heat that substitutes natural gas in a district heating plan | kWh  | 41.5  |
| Perlite replacing concrete                                         | kg   | 85    |
| Electricity from incinerating waste perlite                        | kWh  | -0.67 |
| Thermal energy from incinerating waste perlite                     | kWh  | -0.17 |
| Recycled polypropylene produced                                    | kg   | 0.84  |
| Electricity from packaging disposal                                | kWh  | 0.58  |
| Thermal energy from packaging disposal                             | kWh  | 1.00  |
| Recycled HDPE produced                                             | kg   | 0.19  |

### Additional technical information

Nordisk Perlite is a supplier of perlite products for many different applications; from filtration to horticulture to insulation. The products are all based on expanded perlite. The insulation products have an indefinite service life and require no maintenance during use. Norlite Perlite 0515 SC, 0530 SC and 0560 SC can be reused either for new insulating jobs or as light weight aggregate in concrete.

## LCA: Results

System boundaries (X=included, MND= module not declared, MNR=module not relevant)

| Product stage |           |               | Assembly stage |          | Use stage |             |        |             |               |                        |                       | End of life stage          |           |                  |          | Benefits & loads beyond system boundary |
|---------------|-----------|---------------|----------------|----------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|----------|-----------------------------------------|
| Raw materials | Transport | Manufacturing | Transport      | Assembly | Use       | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling-potential      |
| A1            | A2        | A3            | A4             | A5       | B1        | B2          | B3     | B4          | B5            | B6                     | B7                    | C1                         | C2        | C3               | C4       | D                                       |
| X             | X         | X             | X              | X        | X         | X           | X      | X           | X             | X                      | X                     | X                          | X         | X                | X        | X                                       |



## Core environmental impact indicators

| Indicator      | Unit                   | A1-A3    | A4        | A5       | B | C1       | C2        | C3       | C4 | D         |
|----------------|------------------------|----------|-----------|----------|---|----------|-----------|----------|----|-----------|
| GWP-total      | kg CO2 eq.             | 2.09E+01 | 2.38E+00  | 2.48E-01 | 0 | 4.75E-03 | 5.12E-01  | 6.03E-01 | 0  | -7.86E+00 |
| GWP-fossil     | kg CO2 eq.             | 2.08E+01 | 2.37E+00  | 2.44E-01 | 0 | 4.73E-03 | 5.10E-01  | 5.76E-01 | 0  | -7.85E+00 |
| GWP-biogenic   | kg CO2 eq.             | 1.81E-02 | -3.25E-03 | 4.26E-03 | 0 | 2.22E-05 | -7.00E-04 | 2.59E-02 | 0  | -6.90E-03 |
| GWP-LULUC      | kg CO2 eq.             | 1.19E-02 | 1.31E-02  | 9.05E-05 | 0 | 1.68E-06 | 2.83E-03  | 1.14E-03 | 0  | -5.79E-03 |
| ODP            | kg CFC11 eq.           | 1.48E-04 | 1.41E-13  | 7.18E-10 | 0 | 8.25E-14 | 3.04E-14  | 5.33E-09 | 0  | -1.21E-11 |
| AP             | mol H <sup>+</sup> eq. | 2.35E-01 | 5.03E-03  | 4.63E-04 | 0 | 7.50E-06 | 9.51E-04  | 2.31E-03 | 0  | -1.47E-02 |
| EP-freshwater  | kg P eq.               | 1.28E-03 | 7.02E-06  | 1.23E-06 | 0 | 2.69E-08 | 1.51E-06  | 1.15E-06 | 0  | -5.81E-06 |
| EP-marine      | kg N eq.               | 5.79E-02 | 2.16E-03  | 1.63E-04 | 0 | 2.54E-06 | 3.96E-04  | 9.30E-04 | 0  | -4.86E-03 |
| EP-terrestrial | mol N eq.              | 6.33E-01 | 2.44E-02  | 1.65E-03 | 0 | 2.48E-05 | 4.50E-03  | 1.02E-02 | 0  | -5.33E-02 |
| POCP           | kg NMVOC eq.           | 1.64E-01 | 4.54E-03  | 4.06E-04 | 0 | 6.06E-06 | 8.52E-04  | 2.54E-03 | 0  | -1.37E-02 |
| ADP-M&M        | kg Sb eq.              | 1.59E-05 | 1.97E-07  | 1.14E-07 | 0 | 2.51E-09 | 4.24E-08  | 2.89E-07 | 0  | -3.41E-07 |
| ADP-fossil     | MJ                     | 3.04E+02 | 3.14E+01  | 2.92E+00 | 0 | 5.67E-02 | 6.77E+00  | 9.47E+00 | 0  | -4.50E+01 |
| WDP            | m <sup>3</sup>         | 2.92E+00 | 2.11E-02  | 5.82E-02 | 0 | 3.98E-04 | 4.55E-03  | 3.74E-01 | 0  | -5.74E-01 |

**GWP-total:** Global Warming Potential; **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:** Depletion potential of the stratospheric ozone layer; **AP:** Acidification potential, Accumulated Exceedance; **EP-freshwater:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See "additional Norwegian requirements" for indicator given as PO4 eq. **EP-marine:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial:** Eutrophication potential, Accumulated Exceedance; **POCP:** Formation potential of tropospheric ozone; **ADP-M&M:** Abiotic depletion potential for non-fossil resources (minerals and metals); **ADP-fossil:** Abiotic depletion potential for fossil resources; **WDP:** Water deprivation potential, deprivation weighted water consumption

## Additional environmental impact indicators

| Indicator | Unit              | A1-A3     | A4       | A5       | B | C1       | C2       | C3       | C4 | D         |
|-----------|-------------------|-----------|----------|----------|---|----------|----------|----------|----|-----------|
| PM        | Disease incidence | 3.51E-06  | 2.69E-08 | 4.38E-09 | 0 | 6.76E-11 | 5.32E-09 | 3.33E-08 | 0  | -1.91E-07 |
| IRP       | kBq U235 eq.      | 2.79E-01  | 5.68E-03 | 2.40E-02 | 0 | 5.24E-04 | 1.23E-03 | 8.17E-02 | 0  | -4.02E-01 |
| ETP-fw    | CTUe              | 6.09E+02  | 2.18E+01 | 3.62E+00 | 0 | 1.93E-02 | 4.70E+00 | 2.45E+01 | 0  | -2.28E+01 |
| HTP-c     | CTUh              | 5.02E-09  | 4.40E-10 | 9.63E-11 | 0 | 1.92E-12 | 9.48E-11 | 1.55E-10 | 0  | -1.01E-09 |
| HTP-nc    | CTUh              | 1.34E-07  | 2.41E-08 | 3.06E-09 | 0 | 4.23E-11 | 5.16E-09 | 1.20E-08 | 0  | -1.03E-07 |
| SAP       | Dimensionless     | -3.01E+01 | 1.08E+01 | 3.76E+00 | 0 | 8.26E-02 | 2.33E+00 | 2.04E+00 | 0  | -9.92E+00 |

**PM:** Particulate matter emissions; **IRP:** Ionising radiation, human health; **ETP-fw:** Ecotoxicity (freshwater); **ETP-c:** Human toxicity, cancer effects; **HTP-nc:** Human toxicity, non-cancer effects; **SQP:** Land use related impacts / soil quality

## Classification of disclaimers to the declaration of core and additional environmental impact indicators

| ILCD classification                                                                                                                                                                                                                                                                                                                                                                                                                                          | Indicator                                                                                           | Disclaimer |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------|
| ILCD type / level 1                                                                                                                                                                                                                                                                                                                                                                                                                                          | Global warming potential (GWP)                                                                      | None       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Depletion potential of the stratospheric ozone layer (ODP)                                          | None       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Potential incidence of disease due to PM emissions (PM)                                             | None       |
| ILCD type / level 2                                                                                                                                                                                                                                                                                                                                                                                                                                          | Acidification potential, Accumulated Exceedance (AP)                                                | None       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater) | None       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)         | None       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Eutrophication potential, Accumulated Exceedance (EP-terrestrial)                                   | None       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Formation potential of tropospheric ozone (POCP)                                                    | None       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Potential Human exposure efficiency relative to U235 (IRP)                                          | 1          |
| ILCD type / level 3                                                                                                                                                                                                                                                                                                                                                                                                                                          | Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)                          | 2          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Abiotic depletion potential for fossil resources (ADP-fossil)                                       | 2          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Water (user) deprivation potential, deprivation-weighted water consumption (WDP)                    | 2          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Potential Comparative Toxic Unit for ecosystems (ETP-fw)                                            | 2          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Potential Comparative Toxic Unit for humans (HTP-c)                                                 | 2          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Potential Comparative Toxic Unit for humans (HTP-nc)                                                | 2          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Potential Soil quality index (SQP)                                                                  | 2          |
| <p><b>Disclaimer 1</b> – 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.</p> |                                                                                                     |            |
| <p><b>Disclaimer 2</b> – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator</p>                                                                                                                                                                                                                                                 |                                                                                                     |            |

## Resource use

| Indicator | Unit           | A1-A3    | A4       | A5       | B | C1       | C2       | C3       | C4 | D         |
|-----------|----------------|----------|----------|----------|---|----------|----------|----------|----|-----------|
| RPEE      | MJ             | 3.31E+01 | 1.79E+00 | 5.42E+00 | 0 | 1.20E-01 | 3.85E-01 | 1.82E+00 | 0  | -9.05E+00 |
| RPEM      | MJ             | 2.85E+00 | 0.00E+00 | 0.00E+00 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0  | 0.00E+00  |
| TPE       | MJ             | 3.31E+01 | 1.79E+00 | 5.42E+00 | 0 | 1.20E-01 | 3.85E-01 | 1.82E+00 | 0  | -9.05E+00 |
| NRPE      | MJ             | 3.04E+02 | 3.15E+01 | 2.92E+00 | 0 | 5.67E-02 | 6.79E+00 | 9.48E+00 | 0  | -4.51E+01 |
| NRPM      | MJ             | 4.48E+01 | 0.00E+00 | 0.00E+00 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0  | 0.00E+00  |
| TRPE      | MJ             | 3.04E+02 | 3.15E+01 | 2.92E+00 | 0 | 5.67E-02 | 6.79E+00 | 9.48E+00 | 0  | -4.51E+01 |
| SM        | kg             | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0  | 0.00E+00  |
| RSF       | MJ             | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0  | 3.74E-02  |
| NRSF      | MJ             | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0  | 1.46E-01  |
| W         | m <sup>3</sup> | 7.59E-02 | 2.02E-03 | 2.82E-03 | 0 | 4.15E-05 | 4.35E-04 | 9.57E-03 | 0  | -1.77E-02 |

*RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non-renewable primary energy resources used as energy carrier; NRPM Non-renewable primary energy resources used as materials; TRPE Total use of non-renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non-renewable secondary fuels; W Use of net fresh water*

## End of life - Waste

| Indicator | Unit | A1-A3    | A4       | A5       | B | C1       | C2       | C3       | C4 | D         |
|-----------|------|----------|----------|----------|---|----------|----------|----------|----|-----------|
| HW        | kg   | 1.31E-08 | 1.51E-10 | 6.37E-10 | 0 | 1.37E-11 | 3.25E-11 | 3.89E-10 | 0  | -1.51E-09 |
| NHW       | kg   | 1.28E-01 | 4.51E-03 | 5.28E-01 | 0 | 1.92E-04 | 9.73E-04 | 3.30E+00 | 0  | -2.56E+00 |
| RW        | kg   | 1.15E-03 | 3.88E-05 | 2.26E-04 | 0 | 4.72E-06 | 8.36E-06 | 5.65E-04 | 0  | -2.38E-03 |

*HW Hazardous waste disposed; NHW Non-hazardous waste disposed; RW Radioactive waste disposed*

## End of life – output flow

| Indicator | Unit | A1-A3     | A4       | A5        | B | C1       | C2       | C3       | C4 | D        |
|-----------|------|-----------|----------|-----------|---|----------|----------|----------|----|----------|
| CR        | kg   | 0.00E+00  | 0.00E+00 | 1.53E-01  | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0  | 0.00E+00 |
| MR        | kg   | 3.44E-03  | 0.00E+00 | 1.09E+00  | 0 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0  | 8.50E+01 |
| MER       | kg   | 0.00E+00  | 0.00E+00 | 3.76E-01  | 0 | 0.00E+00 | 0.00E+00 | 2.55E-03 | 0  | 0.00E+00 |
| EEE       | MJ   | -1.54E-01 | 0.00E+00 | -1.87E-01 | 0 | 0.00E+00 | 0.00E+00 | 1.40E+00 | 0  | 0.00E+00 |
| ETE       | MJ   | -1.51E+02 | 0.00E+00 | -4.81E-02 | 0 | 0.00E+00 | 0.00E+00 | 3.59E-01 | 0  | 0.00E+00 |

*CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy*

Reading example: 9,0 E-03 = 9,0\*10<sup>-3</sup> = 0,009

## Information describing the biogenic carbon content at the factory gate

| Biogenic carbon content                               | Unit | Value  |
|-------------------------------------------------------|------|--------|
| Biogenic carbon content in product                    | kg C | 0      |
| Biogenic carbon content in the accompanying packaging | kg C | 0.0048 |

44/12 is the ratio between the molecular mass of CO<sub>2</sub> and C molecules

## Additional Norwegian requirements

### Greenhouse gas emission from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

| National electricity grid                           | Unit                       | Value |
|-----------------------------------------------------|----------------------------|-------|
| Denmark (residual fuel mix, Carbon Footprint, 2022) | kg CO <sub>2</sub> -eq/kWh | 0.428 |

### Additional environmental impact indicators required in NPCR Part A for construction products

In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator for GWP has been sub-divided into the following:

GWP-IOBC Climate impacts calculated according to the principle of instantaneous oxidation

GWP-BC Climate impacts from the net uptake and emission of biogenic carbon from each module.

In addition, EP-freshwater shall also be declared as PO<sub>4</sub> eq.

| Indicator      | Unit                   | A1       | A2       | A3        | A1-A3    |
|----------------|------------------------|----------|----------|-----------|----------|
| EP-freshwater* | kg PO <sub>4</sub> eq. | 9.13E-03 | 1.63E-02 | 1.10E-03  | 2.65E-02 |
| GWP-IOBC       | kg CO <sub>2</sub> eq. | 5.59E+00 | 5.62E+00 | 9.62E+00  | 2.08E+01 |
| GWP-BC         | kg CO <sub>2</sub> eq. | 6.22E-02 | 4.81E-03 | -4.89E-02 | 1.81E-02 |
| GWP            | kg CO <sub>2</sub> eq. | 5.66E+00 | 5.63E+00 | 9.57E+00  | 2.09E+01 |

**EP-freshwater\*** Eutrophication potential, fraction of nutrients reaching freshwater end compartment. Declared as PO<sub>4</sub> eq. **GWP-IOBC** Global warming potential calculated according to the principle of instantaneous oxidation. **GWP-BC** Global warming potential from net uptake and emissions of biogenic carbon from the materials in each module. **GWP** Global warming potential

## Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers. Documentation available upon request to EPD owner.

- ✓ The product contains no substances given by the REACH Candidate list or the Norwegian priority list.
- ☐ The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.
- ☐ The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.
- ☐ The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiten, Annex III), see table.

## Indoor environment

The product meets the requirements for low emissions.

## Carbon footprint

Carbon footprint has not been worked out for the product.

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