epd-norge
Global program operatør

# Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

## Foamrox insulation element with a thickness of 104 mm

FOAMROX®

The Norwegian EPD Foundation

**Owner of the declaration:**
Foamrox AS

**Product:**
Foamrox insulation element with a thickness of 104 mm

**Declared unit:**
1 m2

**This declaration is based on Product Category Rules:**
CEN Standard EN 15804:2012+A2:2019 serves as core PCR
NPCR Part A: Construction products and services. Ver. 2.0 March 2021

**Program operator:**
The Norwegian EPD Foundation

**Declaration number:**

NEPD-7059-6457-EN

**Registration number:**

NEPD-7059-6457-EN

**Issue date:** 11.07.2024

**Valid to:** 11.07.2029

**EPD software:**
LCAno EPD generator ID: 256727

## General information

**Product**

Foamrox insulation element with a thickness of 104 mm

**Owner of the declaration:**

Foamrox AS
Contact person: Glenn Alexander Jacobsen
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**Program operator:**

The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
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**Manufacturer:**

Foamrox AS

**Declaration number:**

NEPD-7059-6457-EN

**Place of production:**

Foamrox AS
Bjørumsvegen 19
4820 Froland, Norway

**This declaration is based on Product Category Rules:**

CEN Standard EN 15804:2012+A2:2019 serves as core PCR
NPCR Part A: Construction products and services. Ver. 2.0 March 2021

**Management system:**

EN-ISO 14001 and EN-ISO 9001

**Statement of liability:**

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

**Organisation no:**

999 015 891

**Declared unit:**

1 m2 Foamrox insulation element with a thickness of 104 mm

**Issue date:**

11.07.2024

**Declared unit with option:**

A1-A3,A4,A5,C1,C2,C3,C4,D

**Valid to:**

11.07.2029

**Year of study:**

2023

**Functional unit:**

**Comparability:**

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

**The EPD has been worked out by:**

Developer of EPD: Vegard Ruttenborg - NIRAS Norge AS

**Verification:**

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

External third party verifier:

Kristine Bjordal, Asplan Viak

(Independent verifier approved by EPD-Norway)

**Approved:**

Håkon Hauan
Managing Director of EPD-Norway

## Product

### Product description:

Foamrox elements are tailor-made for each project. The elements are mainly used for non-load-bearing walls, fire walls, and tunnel inventory components. The elements are made of cellular glass insulation boards, coated with a strong membrane.

### Product specification

Foamrox elements are used in environments where there is need for isolated, watertight solutions and strict fire requirements. Foamrox can be tailor made for different applications.

| Materials | kg | % |
|---|---|---|
| Chemical | 4,40 | 26,83 |
| Cellular glass | 12,00 | 73,17 |
| Total | 16,40 | 100,00 |

| Packaging | kg | % |
|---|---|---|
| Packaging - Plastic | 0,02 | 94,49 |
| Packaging - Steel straps | 0,00 | 5,51 |
| Total incl. packaging | 16,43 | 100,00 |

### Technical data:

The weight of the Foamrox insulation element is 16,4 kg/m2. Thickness is 104mm.

### Market:

International. The Norwegian market is used for scenarios in module A4 and end-of-life stages.

### Reference service life, product

Due to its closed-cell glass structure, foam glass has good insulation capabilities and a long life span (EPD Glapor Werk Mitterteich GmbH, 2023). The membrane is made of polyurea, a strong coating material.

### Reference service life, building or construction works

## LCA: Calculation rules

### Declared unit:

1 m2 Foamrox insulation element with a thickness of 104 mm

### Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

### Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used.

### Data quality:

Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Generic background data is from Ecoinvent v3.6 calculated with OpenLCA v1.11. Characterization factors from EN15804:2012+A2:2019, EF 3.0. Generic data <10 years old. Ecoinvent system model used: cut-off. The data quality of the raw materials in A1 is presented in the table below.
The data collection period for manufacturer data: February to April 2024.

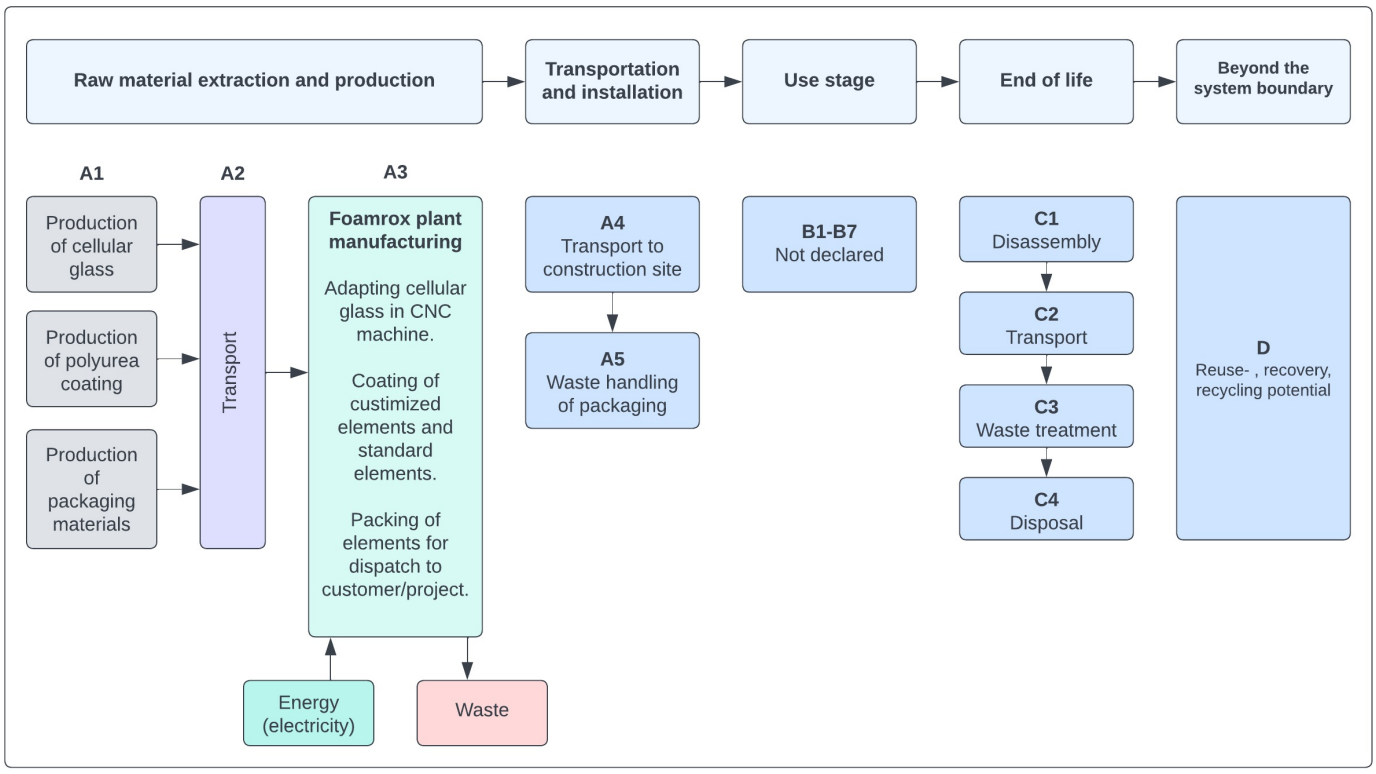
| Materials | Source | Data quality | Year |
|---|---|---|---|
| Cellular glass | EPD-GLP-20230179-CBA2-EN | EPD | 2022 |
| Chemical | ecoinvent 3.6 | Database | 2019 |
| Chemical | S-P-03356 | EPD | 2021 |
| Packaging - Plastic | ecoinvent 3.6 | Database | 2019 |
| Packaging - Steel straps | ecoinvent 3.6 | Database | 2019 |

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

| Product stage | | | Construction installation stage | | Use stage | | | | | | | End of life stage | | | | Beyond the system boundaries |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | MND | MND | MND | MND | MND | MND | MND | X | X | X | X | X |

### System boundary:

Type of EPD: Cradle-to-grave with options (A1-A5, C1-C4, D). All processes from raw material extraction to production at the factory are included in the analysis (A1-A3) along with life cycle scenario for transportation to market (Norway) (A4) is included. In addition, end of life stage (C1-C4) and beyond the system boundaries (D) are included. Module A1-A4 are shown in the flow chart below. The main production processes at the Foamrox factory are cutting of cellular glass boards and coating with polyurea. The processes requires energy consumption and produces waste. The flow chart of the life cycle modules are shown in the flow chart.




### Additional technical information:

## LCA: Scenarios and additional technical information

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

Module A4-A5:
The distribution of the product is based on a generic scenario with a transport distance of 300 km. The product is used in a wide range of structures and is therefore installed using different techniques and with different requirements for materials and energy consumption. It is therefore assumed that it is not possible to provide an average scenario. Hence, the installation in module A5 only includes waste handling of packaging.

Module B1-B6:
Not declared.

Module C1-C4:
In this study, two scenarios are provided for C1-C4. Scenario 1 is a generic scenario which describes the typical acitivites for the end of life when there is not implemented any specific reycling scheme at the construction site. The second scenario describes how the cellular glass can be reused as an aggregate. Only scenario 1 is included in the original results tables. Additional results for scenario 2 are added to Additional Environmental Information.

Scenario 1:
The first scenario is a generic scenario where it is assumed that the product is manually deconstructed, thus module C1 does not contain any impacts. The entire product is disposed of as residual waste and treated in an incineration plant.

Scenario 2:
The second scenario assumes that the polyurea and cellular glass is delaminated. The cellular glass is reused at the building site as an aggregate and the polyurea is disposed of as residual waste and sent to munucipal incineration. The deconstruction is assumed to be carried out manually, thus module C1 does not cause any impacts. The energy use to crush the cellular glass into glass gravel is taken from the Glapor EPD (EPD Glapor Werk Mitterteich GmbH, 2023).
For the disposal of Foamrox products, specific procedures shall be carefully followed to ensure safe and environmentally friendly handling. The polyurea membrane is delaminated from the cellular glass using a knife or other sharp tools. After delamination, the membrane must be disposed of as residual waste and sent to incineration. It is important that both cellular glass and polyurea are delaminated correctly.
The cellular glass should be crushed with heavy or impact equipment, such as a wheel loader or sledgehammer. The crushed pieces of cellular glass gravel can be used as a fill material on site, as the it does not have a negative impact on the environment.
Reuse of cellular glass in production is not an option, as Foamrox is not a cellular glass manufacturer and it is not practical to transport the material to Germany for reuse.

Module D:

Scenario 1:
The benefits of exported energy from energy recovery in an incineration plant is calculated with substitution of Norwegian electricity market mix and district heating mix.

Scenario 2:
The scenario includes the benefits from replacing natural crushed gravel and exported energy from incineration of the polyurea membrane in a municipal waste incineration plant. The benefits of replacing natural crushed gravel is calculated for the net flow of the difference between the input of glass cullets and output of recycled cellular glass. The manufacturing of cellular glass uses 92 % recycled glass. Hence, the net flow of cellular glass in module D is 8%.

| Transport from production place to user (A4) | Capacity utilisation (incl. return) % | Distance (km) | Fuel/Energy Consumption | Unit | Value (Liter/tonne) |
|---|---|---|---|---|---|
| Truck, over 32 tonnes, EURO 6 (km) - Europe | 53,3 % | 300 | 0,023 | l/tkm | 6,90 |

| Assembly (A5) | Unit | Value | | | |
|---|---|---|---|---|---|
| Waste, metal, to average treatment (kg) | kg | 0,00 | | | |
| Waste, packaging, plastic film (LDPE), to average treatment (kg) | kg | 0,02 | | | |

| Transport to waste processing (C2) | Capacity utilisation (incl. return) % | Distance (km) | Fuel/Energy Consumption | Unit | Value (Liter/tonne) |
|---|---|---|---|---|---|
| Truck, over 32 tonnes, EURO 6 (km) - Europe | 53,3 % | 83 | 0,023 | l/tkm | 1,91 |

| Waste processing (C3) | Unit | Value | | | |
|---|---|---|---|---|---|
| Waste treatment per kg Polyurethane (PU), incineration with fly ash extraction (kg) | kg/DU | 4,40 | | | |
| Waste treatment per kg Glass, incineration with fly ash extraction (kg) | kg/DU | 12,00 | | | |

| Disposal (C4) | Unit | Value | | | |
|---|---|---|---|---|---|
| Landfilling of ashes from incineration of Glass, process of ashes and residues (kg) | kg | 12,00 | | | |
| Landfilling of ashes from incineration of Polyurethane (PU), process per kg ashes and residues (kg) | kg | 0,17 | | | |

| Benefits and loads beyond the system boundaries (D) | Unit | Value | | | |
|---|---|---|---|---|---|
| Substitution of electricity, in Norway (MJ) | MJ | 6,34 | | | |
| Substitution of thermal energy, district heating, in Norway (MJ) | MJ | 95,99 | | | |

## LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

| Environmental impact | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Indicator | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| | GWP-total | kg $CO_2$ -eq | 3,20E+01 | 4,29E-01 | 1,92E-03 | 0 | 1,19E-01 | 1,19E+01 | 1,43E-01 | -5,77E-01 |
| | GWP-fossil | kg $CO_2$ -eq | 3,15E+01 | 4,29E-01 | 1,92E-03 | 0 | 1,19E-01 | 1,19E+01 | 1,43E-01 | -5,57E-01 |
| | GWP-biogenic | kg $CO_2$ -eq | 4,71E-01 | 1,84E-04 | 2,70E-07 | 0 | 5,09E-05 | 1,55E-03 | 1,05E-04 | -1,15E-03 |
| | GWP-luluc | kg $CO_2$ -eq | 1,86E-02 | 1,31E-04 | 1,53E-07 | 0 | 3,62E-05 | 7,93E-05 | 4,17E-05 | -1,92E-02 |
| | ODP | kg CFC11 -eq | 4,55E-06 | 1,03E-07 | 1,19E-10 | 0 | 2,86E-08 | 6,13E-08 | 4,23E-08 | -4,05E-02 |
| | AP | mol H+ -eq | 1,54E-01 | 1,38E-03 | 2,42E-06 | 0 | 3,82E-04 | 1,03E-02 | 9,77E-04 | -4,58E-03 |
| | EP-FreshWater | kg P -eq | 8,97E-04 | 3,41E-06 | 4,07E-09 | 0 | 9,45E-07 | 4,64E-06 | 1,46E-06 | -4,95E-05 |
| | EP-Marine | kg N -eq | 3,92E-02 | 3,03E-04 | 2,17E-06 | 0 | 8,37E-05 | 5,73E-03 | 3,47E-04 | -1,50E-03 |
| | EP-Terrestial | mol N -eq | 3,12E-01 | 3,38E-03 | 8,66E-06 | 0 | 9,34E-04 | 5,47E-02 | 3,83E-03 | -1,62E-02 |
| | POCP | kg NMVOC -eq | 1,03E-01 | 1,33E-03 | 2,84E-06 | 0 | 3,67E-04 | 1,31E-02 | 1,10E-03 | -4,47E-03 |
| | ADP-minerals&metals[1] | kg Sb-eq | 2,44E-04 | 7,65E-06 | 1,07E-08 | 0 | 2,12E-06 | 2,35E-06 | 2,36E-06 | -5,54E-06 |
| | ADP-fossil[1] | MJ | 5,95E+02 | 6,97E+00 | 8,14E-03 | 0 | 1,93E+00 | 5,11E+00 | 3,14E+00 | -7,96E+00 |
| | WDP[1] | $m^3$ | 1,79E+03 | 5,34E+00 | 2,80E-02 | 0 | 1,48E+00 | 1,66E+01 | 6,90E+00 | -9,91E+01 |

GWP-total = Global 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 = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment: EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. 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

### Remarks to environmental impacts

An additional set of results has not been calculated based on a market based approach for electricity consumption.

## Additional environmental impact indicators

| Indicator | | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| | PM | Disease incidence | 1,49E-06 | 3,94E-08 | 4,30E-11 | 0 | 1,09E-08 | 5,13E-08 | 1,77E-08 | -2,78E-07 |
| | IRP[2] | kgBq U235 -eq | 1,32E+00 | 3,05E-02 | 3,67E-05 | 0 | 8,43E-03 | 8,33E-03 | 1,27E-02 | -5,08E-02 |
| | ETP-fw[1] | CTUe | 1,00E+03 | 5,10E+00 | 7,70E-03 | 0 | 1,41E+00 | 3,17E+01 | 1,96E+00 | -4,33E+01 |
| | HTP-c[1] | CTUh | 1,83E-07 | 0,00E+00 | 0,00E+00 | 0 | 0,00E+00 | 9,58E-10 | 7,20E-11 | -7,93E-10 |
| | HTP-nc[1] | CTUh | 2,07E-06 | 4,93E-09 | 7,00E-12 | 0 | 1,36E-09 | 3,39E-08 | 2,00E-09 | -4,15E-08 |
| | SQP[1] | dimensionless | 1,54E+02 | 7,99E+00 | 1,39E-02 | 0 | 2,21E+00 | 6,11E-01 | 6,85E+00 | -5,32E+01 |

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 = Potential Soil Quality Index (dimensionless)

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. 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
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 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Indicator | | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| | PERE | MJ | 1,56E+02 | 8,77E-02 | 2,02E-04 | 0 | 2,43E-02 | 1,50E-01 | 6,16E-02 | -4,92E+01 |
| | PERM | MJ | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | PERT | MJ | 1,56E+02 | 8,77E-02 | 2,02E-04 | 0 | 2,43E-02 | 1,50E-01 | 6,16E-02 | -4,92E+01 |
| | PENRE | MJ | 6,19E+02 | 6,97E+00 | 8,14E-03 | 0 | 1,93E+00 | 5,11E+00 | 3,14E+00 | -7,96E+00 |
| | PENRM | MJ | 4,06E+00 | 0,00E+00 | -1,02E+00 | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | PENRT | MJ | 6,23E+02 | 6,97E+00 | -1,01E+00 | 0 | 1,93E+00 | 5,11E+00 | 3,14E+00 | -7,96E+00 |
| | SM | kg | 1,69E+01 | 0,00E+00 | 0,00E+00 | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | RSF | MJ | 1,34E-01 | 3,07E-03 | 5,34E-06 | 0 | 8,49E-04 | 3,48E-03 | 1,62E-03 | -8,61E-03 |
| | NRSF | MJ | 3,77E-01 | 1,03E-02 | 1,41E-05 | 0 | 2,84E-03 | 0,00E+00 | 5,75E-02 | -2,91E+00 |
| | FW | $m^3$ | 1,38E+00 | 7,93E-04 | 4,18E-06 | 0 | 2,19E-04 | 1,79E-02 | 2,83E-03 | -5,92E-02 |

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 materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

## End of life - Waste

| Indicator | | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| | HWD | kg | 1,06E-01 | 3,81E-04 | 0,00E+00 | 0 | 1,06E-04 | 0,00E+00 | 1,21E+01 | -3,74E-04 |
| | NHWD | kg | 7,99E+00 | 6,06E-01 | 2,54E-02 | 0 | 1,68E-01 | 1,20E+01 | 1,94E-01 | -1,88E-01 |
| | RWD | kg | 1,53E-03 | 4,76E-05 | 0,00E+00 | 0 | 1,32E-05 | 0,00E+00 | 1,94E-05 | -4,17E-05 |

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

## End of life - Output flow

| Indicator | | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| | CRU | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | MFR | kg | 2,96E-01 | 0,00E+00 | 1,37E-02 | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | MER | kg | 4,30E-01 | 0,00E+00 | 1,20E-06 | 0 | 0,00E+00 | 1,64E+01 | 0,00E+00 | 0,00E+00 |
| | EEE | MJ | 2,59E-01 | 0,00E+00 | 1,84E-06 | 0 | 0,00E+00 | 6,34E+00 | 0,00E+00 | 0,00E+00 |
| | EET | MJ | 3,92E+00 | 0,00E+00 | 2,79E-05 | 0 | 0,00E+00 | 9,60E+01 | 0,00E+00 | 0,00E+00 |

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

## Biogenic Carbon Content

| Indicator | Unit | At the factory gate |
|---|---|---|
| Biogenic carbon content in product | kg C | 0,00E+00 |
| Biogenic carbon content in accompanying packaging | kg C | 0,00E+00 |

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO2

## Additional requirements

### Location based electricity mix 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 the grid) of applied electricity for the manufacturing process (A3) per functional unit.

| Electricity source | [kWh] | GWP total [kg/CO2-eq/kWh] | SUM [kg CO2-eq] |
|---|---|---|---|
| Norwegian mix (market for electricity, low voltage, ecoinvent 3.6) | 30,7 | 0,024 | 0,74 |
| | | | |

### Guaranetees of origin from the use of electricity in the manufacturing phase

Where guarantees of origin is applied in stead of national production mix - the electricity for the manufacturing process (A3) shall be stated clearly in the EPD per functional unit.

| Electricity source | [kWh] | GWP total [kg/CO2-eq/kWh] | SUM [kg CO2-eq] |
|---|---|---|---|
| Amount of guarantee of origin electricity used in the foreground | 0 | | |
| Amount of residual mix electricity used in the foreground | 30,7 | 0,6 | 19,2 |

The residual mix is calculated using the following methodology [Ecoinvent v3.10, Residual mix Norway, LCIA method IPCC 2021 GWP100]

### Dangerous substances

The product contains no substances given by the REACH Candidate list.

### Indoor environment

Not relevant

## Additional Environmental Information

| Additional environmental impact indicators required in NPCR Part A for construction products | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
| GWPIOBC | kg $CO_2$ -eq | 3,08E+01 | 4,29E-01 | 1,92E-03 | 0 | 1,19E-01 | 1,19E+01 | 1,43E-01 | -5,68E-01 |

GWP-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

### Additional Waste Scenario

The following information describes the additional waste scenarios in the different modules of the EPD.

The scenario description is given in "LCA: Scenarios and additional technical information" on page 5.

| Transport to waste processing (C2) | Capacity utilisation (incl. return) % | Distance (km) | Fuel/Energy Consumption | Unit | Value (Liter/tonne) |
|---|---|---|---|---|---|
| Truck, over 32 tonnes, EURO 6 (km) - Europe | 53,3 % | 83 | 0,023 | l/tkm | 1,91 |

| Waste processing (C3) | Unit | Value | | | |
|---|---|---|---|---|---|
| Waste treatment per kg Polyurethane (PU), incineration with fly ash extraction (kg) | kg/DU | 4,40 | | | |
| Waste treatment of cellular glass, crushing (kg) | kg/DU | 12,00 | | | |

| Disposal (C4) | Unit | Value | | | |
|---|---|---|---|---|---|
| Landfilling of ashes from incineration of Polyurethane (PU), process per kg ashes and residues (kg) | kg | 0,17 | | | |

| Benefits and loads beyond the system boundaries (D) | Unit | Value | | | |
|---|---|---|---|---|---|
| Substitution of electricity, in Norway (MJ) | MJ | 6,18 | | | |
| Substitution of primary light weight aggregates (kg) | kg/DU | 0,96 | | | |
| Substitution of thermal energy, district heating, in Norway (MJ) | MJ | 93,57 | | | |

## LCA: Results Additional Waste Scenario

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

| Environmental impact | | | | | | | |
|---|---|---|---|---|---|---|---|
| Indicator | | Unit | C1 | C2 | C3 | C4 | D |
| | GWP-total | kg $CO_2$ -eq | 0 | 3,20E-02 | 1,19E+01 | 1,41E-02 | -8,03E-01 |
| | GWP-fossil | kg $CO_2$ -eq | 0 | 3,20E-02 | 1,19E+01 | 1,41E-02 | -7,83E-01 |
| | GWP-biogenic | kg $CO_2$ -eq | 0 | 1,37E-05 | 2,31E-04 | 7,16E-06 | -1,71E-03 |
| | GWP-luluc | kg $CO_2$ -eq | 0 | 9,75E-06 | 7,22E-05 | 1,95E-06 | -1,88E-02 |
| | ODP | kg CFC11 -eq | 0 | 7,71E-09 | 5,80E-08 | 1,22E-09 | -3,95E-02 |
| | AP | mol H+ -eq | 0 | 1,03E-04 | 1,03E-02 | 4,44E-05 | -6,39E-03 |
| | EP-FreshWater | kg P -eq | 0 | 2,55E-07 | 6,53E-06 | 1,96E-07 | -6,02E-05 |
| | EP-Marine | kg N -eq | 0 | 2,26E-05 | 5,72E-03 | 1,34E-05 | -1,70E-03 |
| | EP-Terrestial | mol N -eq | 0 | 2,52E-04 | 5,46E-02 | 1,54E-04 | -1,87E-02 |
| | POCP | kg NMVOC -eq | 0 | 9,88E-05 | 1,29E-02 | 4,19E-05 | -5,14E-03 |
| | ADP-minerals&metals[1] | kg Sb-eq | 0 | 5,70E-07 | 2,08E-06 | 6,19E-08 | -8,58E-06 |
| | ADP-fossil[1] | MJ | 0 | 5,20E-01 | 5,70E+00 | 1,08E-01 | -1,02E+01 |
| | WDP[1] | $m^3$ | 0 | 3,98E-01 | 1,47E+01 | 1,40E+00 | -1,01E+02 |

GWP-total = Global 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 = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment: EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. 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

| Additional environmental impact indicators | | | | | | | |
|---|---|---|---|---|---|---|---|
| Indicator | | Unit | C1 | C2 | C3 | C4 | D |
| | PM | Disease incidence | 0 | 2,94E-09 | 3,13E-08 | 4,90E-10 | -2,89E-07 |
| | IRP[2] | kgBq U235 -eq | 0 | 2,27E-03 | 9,89E-03 | 5,37E-04 | -5,46E-02 |
| | ETP-fw[1] | CTUe | 0 | 3,80E-01 | 3,01E+01 | 2,41E-01 | -4,81E+01 |
| | HTP-c[1] | CTUh | 0 | 0,00E+00 | 7,42E-10 | 1,20E-11 | -8,81E-10 |
| | HTP-nc[1] | CTUh | 0 | 3,67E-10 | 3,24E-08 | 4,63E-10 | -4,34E-08 |
| | SQP[1] | dimensionless | 0 | 5,96E-01 | 5,69E-01 | 3,35E-01 | -5,53E+01 |

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 = Potential Soil Quality Index (dimensionless)

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. 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
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

| Indicator | | Unit | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| | PERE | MJ | 0 | 6,54E-03 | 1,30E-01 | 7,65E-03 | -4,86E+01 |
| | PERM | MJ | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | PERT | MJ | 0 | 6,54E-03 | 1,30E-01 | 7,65E-03 | -4,86E+01 |
| | PENRE | MJ | 0 | 5,20E-01 | 5,70E+00 | 1,08E-01 | -1,02E+01 |
| | PENRM | MJ | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | PENRT | MJ | 0 | 5,20E-01 | 5,70E+00 | 1,08E-01 | -1,02E+01 |
| | SM | kg | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | -3,60E-03 |
| | RSF | MJ | 0 | 2,29E-04 | 2,99E-03 | 1,89E-04 | -2,58E-02 |
| | NRSF | MJ | 0 | 7,66E-04 | 0,00E+00 | 1,74E-02 | -2,85E+00 |
| | FW | $m^3$ | 0 | 5,91E-05 | 1,76E-02 | 9,96E-05 | -5,93E-02 |

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 materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

## End of life - Waste

| Indicator | | Unit | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| | HWD | kg | 0 | 2,84E-05 | 1,31E-06 | 1,25E-01 | -6,33E-04 |
| | NHWD | kg | 0 | 4,52E-02 | 2,32E-03 | 1,27E-01 | -2,00E-01 |
| | RWD | kg | 0 | 3,55E-06 | 7,38E-06 | 6,46E-07 | -4,79E-05 |

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

## End of life - Output flow

| Indicator | | Unit | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|
| | CRU | kg | 0 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | MFR | kg | 0 | 0,00E+00 | 1,20E+01 | 0,00E+00 | -2,92E-03 |
| | MER | kg | 0 | 0,00E+00 | 4,40E+00 | 0,00E+00 | -1,75E-04 |
| | EEE | MJ | 0 | 0,00E+00 | 6,18E+00 | 0,00E+00 | -3,81E-04 |
| | EET | MJ | 0 | 0,00E+00 | 9,36E+01 | 0,00E+00 | -5,77E-03 |

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

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

| Indicator | Unit | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|
| GWPIOBC | kg $CO_2$ -eq | 0 | 3,20E-02 | 1,19E+01 | 1,47E-02 | -7,95E-01 |

GWP-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

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