# ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

Airfi AHU Model 130
Airfi Oy

**EPD HUB, HUB-1904**
Published on 23.08.2024, last updated on 27.08.2024, valid until 23.08.2029

Created with One Click LCA

# GENERAL INFORMATION

## MANUFACTURER

| | |
|---|---|
| Manufacturer | Airfi Oy |
| Address | Piilipuunkatu 11 |
| Contact details | info@airfi.fi |
| Website | www.airfi.fi |

## EPD STANDARDS, SCOPE AND VERIFICATION

| | |
|---|---|
| Program operator | EPD Hub, hub@epdhub.com |
| Reference standard | EN 15804+A2:2019 und ISO 14025 |
| PCR | EPD Hub Core PCR Version 1.1, 5 Dec 2023 |
| Sector | Construction product |
| Category of EPD | Third party verified EPD |
| Parent EPD number | HUB-1794 |
| Scope of the EPD | Cradle to gate with options, A4-B7, and modules C1-C4, D |
| EPD author | Izabella Lundberg |
| EPD verification | Independent verification of this EPD and data, according to ISO 14025:<br>☐ Internal verification ☑ External verification |
| EPD verifier | Imane Uald lamkaddam, as an authorized verifier acting for EPD Hub Limited |

The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

## PRODUCT

| | |
|---|---|
| Product name | Airfi AHU Model 130 |
| Additional labels | |
| Product reference | 10130011,10130021 |
| Place of production | Piilipuunkatu 11, 21200 Raisio, Finland |
| Period for data | 1.1.2022-31.12.2022 |
| Averaging in EPD | No averaging |
| Variation in GWP-fossil for A1-A3 | % |

## ENVIRONMENTAL DATA SUMMARY

| | |
|---|---|
| **Declared unit** | One unit of Model 130 |
| **Declared unit mass** | 43 kg |
| **GWP-fossil, A1-A3 ($kgCO_2e$)** | 2,32E+02 |
| **GWP-total, A1-A3 ($kgCO_2e$)** | 2,32E+02 |
| **Secondary material, inputs (%)** | 14.8 |
| **Secondary material, outputs (%)** | 98.8 |
| **Total energy use, A1-A3 (kWh)** | 1050 |
| **Net freshwater use, A1-A3 ($m^3$)** | 3.02 |

# PRODUCT AND MANUFACTURER

## ABOUT THE MANUFACTURER

Airfi Oy is a Finnish company driven by a passion for designing and manufacturing the most energy-efficient air handling units (AHUs) on the market. Our strong commitment to sustainability and innovation is evident in every aspect of our operations.
Founded in Raisio, Finland, in 2018, Airfi has quickly established itself as a pioneer in the ventilation industry. Our team of experts is dedicated to developing cutting-edge AHU solutions that prioritize energy efficiency, reliability, and user-friendliness. We take pride in our self-learning frost protection system (AFPS™), which demonstrates our focus on technological advancement.
Works in every environment
– for the environment.

## PRODUCT DESCRIPTION

Airfi air handling units enable fresh and healthy indoor air. The new Airfi air handling units are designed for the demanding conditions of the North. Airfi units have enhanced dehumidification through the bottom of the unit to ensure efficient and energy-friendly operation during cold periods.
Airfi Frost Pro System (AFPS™) is available as standard in all air handling units produced by Airfi Ltd. The new Airfi Frost Pro System (AFPS™) is a self-learning frost protection system, allowing the air handling unit to optimize its performance and energy efficiency to operate as intended during the cold season!
Airfi Frost Pro System is a Finnish invention, where the heat exchanger is only defrosted when needed, ensuring that the heat exchanger operates properly even during long periods where the temperature drops below freezing.
The energy used to defrost the heat exchanger is scavenged from the exhaust air. This way, the energy provided by the heating element can be retained within the building rather than, for instance, heating the exhaust air with the pre-heating element.
The defrosting function is only used for the precise time required, which saves energy compared to older technologies. The self-learning functionality used in the frost protection system takes individual characteristics of each air handling unit into account, such as filters and heat exchangers becoming dirty over time. You can save a meaningful amount of energy by choosing the energy efficient air handling units built by Airfi Ltd.
Airfi Frost Pro System (AFPS ™) by Airfi Oy has been granted a patent.

Further information can be found at www.airfi.fi.

## PRODUCT RAW MATERIAL MAIN COMPOSITION

| Raw material category | Amount, mass % | Material origin |
|---|---|---|
| Metals | 88.1 | world |
| Minerals | 0.0 | world |
| Fossil materials | 9.0 | world |
| Bio-based materials | 2.9 | world |

## BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

| | |
|---|---|
| Biogenic carbon content in product, kg C | 0.01 |
| Biogenic carbon content in packaging, kg C | 0.49 |

## FUNCTIONAL UNIT AND SERVICE LIFE

| | |
|---|---|
| Declared unit | One unit of Model 130 |
| Mass per declared unit | 43 kg |
| Functional unit | One unit of Model 130 for residential use. 511 m3/h maximum extract air flow 450 m3/h maximum supply air flow. |
| Reference service life | 25 |

## SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

# PRODUCT LIFE-CYCLE

## SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

| Product stage | | | Assembly stage | | Use stage | | | | | | | End of life stage | | | | Beyond the system boundaries | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D | | |
| × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | | |
| Raw materials | Transport | Manufacturing | Transport | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction/ demolition | Transport | Waste processing | Disposal | Reuse | Recovery | Recycling |

*Modules not declared = MND. Modules not relevant = MNR*

## MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

A1

Environmentally friendly practices are at the core of Airfi Ltd's operations. The degree of domesticity of the products is very high. In our material choices, we favor locally produced options and environmentally friendly materials. In addition to taking the environmental impact of materials into consideration, we have also sought to choose materials that will last for the entire life cycle of the building.

We are aware of the environmental impacts of sheet metal and have sought, as far as possible, to use a better option for the environment. The coating used in Jetskin® sheet metal is a more environmentally friendly option compared to electro-galvanized or hot-dip galvanized sheet metal. Of the total amount of sheet metal used in Airfi products, jetskin® constitutes around 45 % of the total amount.

We only use cardboard to package products in our factory. The proportion of recycled fiber in the cardboard we use has been increasing every year. We strive towards minimizing the amount of waste produced in our factory, which is why the production lines generate practically no waste material anymore.

A2

Whenever possible, we use local carriers from the surrounding areas to transport sub-components of Airfi products. Some carriers have already committed to carbon neutral transport of freight. Where possible, products from other European countries will be shipped to Airfi Ltd by road in larger shipments, thus reducing the contribution of freight to the total emissions of the product.

A3

In our production, efforts have been made to minimize the amount of waste generated, which means that there is practically no waste material being produced anymore. Some steel cutting waste is generated and fully recycled. In our factory, production consists largely of final assembly, which means that the environmental impact of manufacturing is low. The electricity used by the company is environmentally friendly hydroelectricity, and the production facilities are heated with district heating from Turku Energia, which produces largely renewable energy.

We use only cardboard as a packaging material for our products, which is also partly made from recycled raw materials.

## TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

A4

Airfi operates mainly in the Finnish market, which means that the delivery and use of the products takes place mainly in Finland. Construction is mainly concentrated in Southern Finland. Due to the central location of the factory, an average transport distance of 150 km has been calculated. This calculation is based on Airfi Ltds domestic traffic reports as well as on driving estimates provided by locally used transport companies.

A5

There is no material waste during the installation of the products. The packaging materials of the products are fully recyclable. No accessories, other supplies or energy consuming tools are required during installation.

## PRODUCT USE AND MAINTENANCE (B1-B7)

The lifetime of an air handling unit is calculated based on the 25-year reference service life generally used in the industry. Airfi air handling units are designed to last a long time. The frame structure is designed to last the entire life cycle of the building, although all calculations are made according to the 25-year reference service life. Any parts that may break can be easily replaced, but the air handling unit will not be subject to regular replacement of parts.

The frequency of replacement of filters that become dirty during operation is calculated to be twice per year, in accordance with the instructions in the user manual. Depending on the location of the property and other factors, less frequent replacement may be possible. The filters are manufactured in Finland and are disposed of via municipal incineration with energy recovery.

The in-service electricity consumption has been calculated based on actual emissions and average consumption of grid electricity in Finland. Airfi Frost Pro System (AFPS™) is available as standard in all air handling units during defrost. The patented Airfi Frost Pro System (AFPS™) is a self-learning frost protection system, allowing the air handling unit to optimize its performance and energy efficiency.

Estimated energy use is 1507 kWh/a with an estimated 24h daily use and average air handling capacity 91 l/s (327.6 m3/h). The estimated energy use takes into account the consumption of all parts of the air handling unit, including the blower fans, resistive heater and electronics. The dataset used for the energy is a Finnish low voltage electricity average market dataset with a GWP total of 0.27 kg CO2e / kWh. This estimate is calculated according to the following standards: SFS-EN 13141-7, LVI 30-10529, YMa 1009/2017, Tasauslaskentaopas 2018, YM moniste 122 and Comission Delegated Regulation (EU) N:o 1253/2014 & N:o 1254/2014.

The operating speed and other adjustments have a significant impact on the electricity consumption. Different scenarios can be calculated with the calculation program available at: https://airfi.fi/en/files/calculation-programme/

Air, soil, and water impacts during the use phase have not been studied.

## PRODUCT END OF LIFE (C1-C4, D)

End-of-Life Cycle (C1-C4)

C1: The impact of deconstruction/dismantling is assumed to be minimal, as air handling units will be manually removed from buildings beforehand.

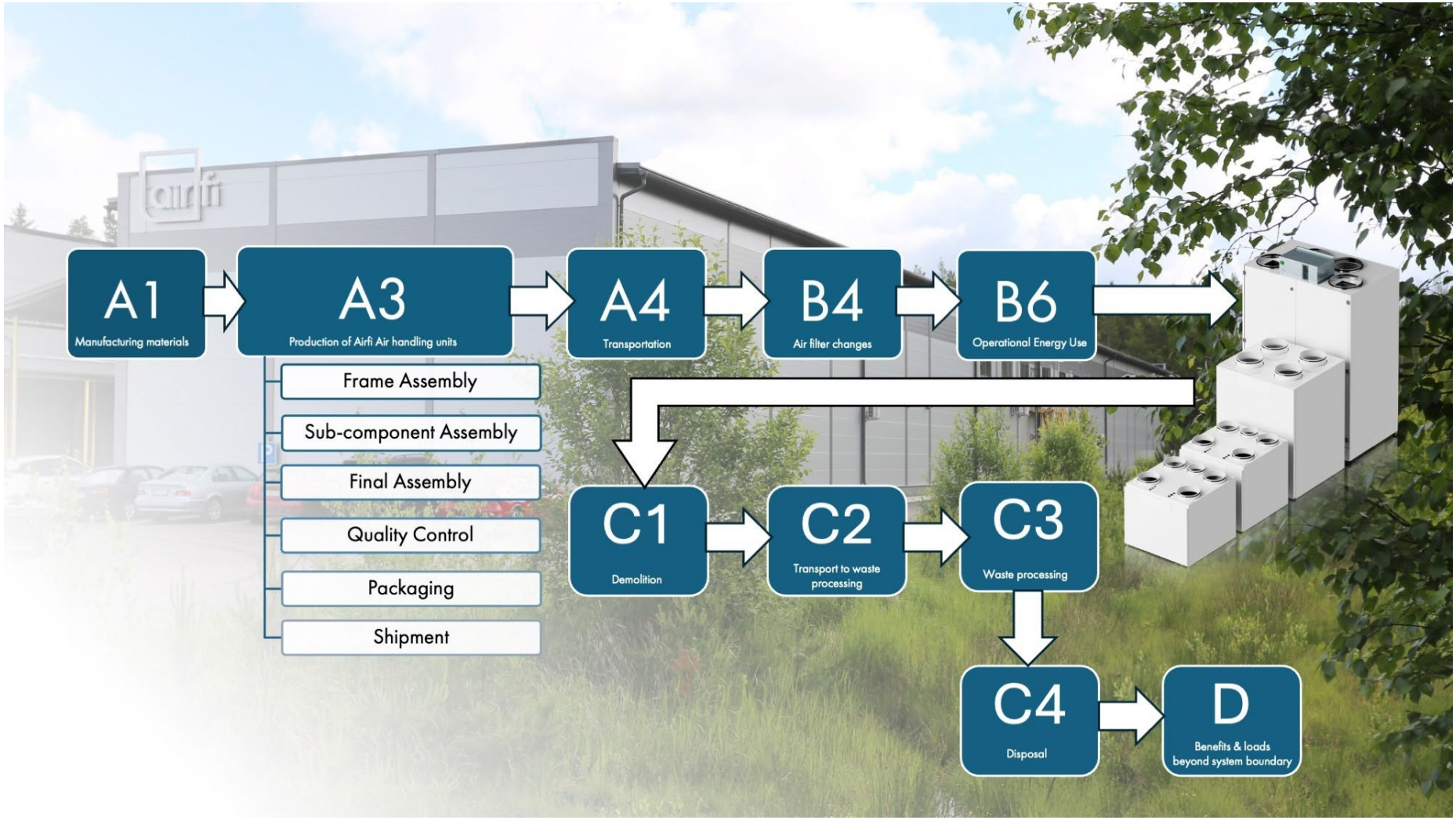
C2: Transport to waste processing facilities was calculated assuming a distance of 50 km.

C3-C4: Waste processing and disposal were modeled according to waste processing statistics published by Statistics Finland (Tilastokeskus). Almost all of the materials used in the machine are recyclable. For metals, we have assumed that 100% will be recycled. Plastics are either assumed to be entirely incinerated with energy recovery, or split between incineration with energy recovery and recycling at 40% and 60% respectively, depending on the material. Air filters are assumed to be incinerated with energy recovery. These categories cover the majority of the materials used in the air handling unit. Small amounts of other materials are considered individually and assumed to be disposed of according to the statistics from Statistics Finland.

Resource Recovery Stage (D)

The potential environmental benefits of various recycled metals and small amounts of other materials from module C3 were considered as substituted materials.

# MANUFACTURING PROCESS



# LIFE-CYCLE ASSESSMENT

## CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

## ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

| Data type | Allocation |
|---|---|
| Raw materials | No allocation |
| Packaging material | No allocation |
| Ancillary materials | No allocation |
| Manufacturing energy and waste | Allocated by mass or volume |

## AVERAGES AND VARIABILITY

| | |
|---|---|
| Type of average | No averaging |
| Averaging method | Not applicable |
| Variation in GWP-fossil for A1-A3 | % |

This EPD is product and factory specific and does not contain average calculations.

## LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.8, Plastics Europe, Federal LCA Commons and One Click LCA databases as sources of environmental data.

# ENVIRONMENTAL IMPACT DATA

## CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GWP – total[1)] | kg $CO_2$e | 2,29E+02 | 1,28E+00 | 1,14E+00 | 2,32E+02 | 1,08E+00 | 1,84E+00 | MNR | 4,30E+01 | MNR | MNR | MNR | 1,02E+04 | MNR | MNR | 1,98E-01 | 5,68E+00 | 4,39E-04 | -1,72E+02 |
| GWP – fossil | kg $CO_2$e | 2,28E+02 | 1,28E+00 | 2,93E+00 | 2,32E+02 | 1,08E+00 | 3,79E-02 | MNR | 4,30E+01 | MNR | MNR | MNR | 1,01E+04 | MNR | MNR | 1,98E-01 | 5,85E+00 | 4,38E-04 | -1,72E+02 |
| GWP – biogenic | kg $CO_2$e | -3,96E-02 | 0,00E+00 | -1,81E+00 | -1,85E+00 | 0,00E+00 | 1,81E+00 | MNR | 0,00E+00 | MNR | MNR | MNR | 0,00E+00 | MNR | MNR | 7,60E-05 | -1,73E-01 | 0,00E+00 | 0,00E+00 |
| GWP – LULUC | kg $CO_2$e | 1,21E+00 | 5,18E-04 | 1,26E-02 | 1,22E+00 | 4,32E-04 | 2,87E-05 | MNR | 3,40E-02 | MNR | MNR | MNR | 9,04E+01 | MNR | MNR | 7,29E-05 | 1,32E-03 | 4,14E-07 | -4,93E-02 |
| Ozone depletion pot. | kg CFC-$_{11}$e | 3,12E-05 | 2,94E-07 | 2,29E-07 | 3,17E-05 | 2,51E-07 | 3,28E-09 | MNR | 2,19E-06 | MNR | MNR | MNR | 5,69E-04 | MNR | MNR | 4,55E-08 | 1,09E-07 | 1,77E-10 | -5,64E-06 |
| Acidification potential | mol $H^+$e | 4,28E+00 | 3,79E-03 | 1,86E-02 | 4,30E+00 | 3,07E-03 | 1,68E-04 | MNR | 1,56E-01 | MNR | MNR | MNR | 4,42E+01 | MNR | MNR | 8,36E-04 | 1,15E-02 | 4,12E-06 | -2,22E+00 |
| EP-freshwater[2)] | kg Pe | 1,88E-02 | 9,34E-06 | 1,60E-04 | 1,90E-02 | 7,72E-06 | 9,20E-07 | MNR | 1,21E-03 | MNR | MNR | MNR | 3,93E-01 | MNR | MNR | 1,62E-06 | 4,46E-05 | 4,59E-09 | -1,20E-02 |
| EP-marine | kg Ne | 2,99E-01 | 8,02E-04 | 4,50E-03 | 3,04E-01 | 6,13E-04 | 4,45E-05 | MNR | 3,07E-02 | MNR | MNR | MNR | 7,01E+00 | MNR | MNR | 2,49E-04 | 2,79E-03 | 1,43E-06 | -2,06E-01 |
| EP-terrestrial | mol Ne | 7,90E+00 | 8,90E-03 | 3,59E-02 | 7,95E+00 | 6,81E-03 | 4,34E-04 | MNR | 3,21E-01 | MNR | MNR | MNR | 8,43E+01 | MNR | MNR | 2,74E-03 | 3,09E-02 | 1,57E-05 | -2,41E+00 |
| POCP ("smog")[3)] | kg NMVOCe | 1,09E+00 | 3,31E-03 | 8,85E-03 | 1,10E+00 | 2,62E-03 | 1,40E-04 | MNR | 1,13E-01 | MNR | MNR | MNR | 2,25E+01 | MNR | MNR | 8,77E-04 | 8,32E-03 | 4,56E-06 | -7,93E-01 |
| ADP-minerals & metals4) | kg Sbe | 4,92E-02 | 4,99E-06 | 1,16E-05 | 4,92E-02 | 3,91E-06 | 4,58E-07 | MNR | 1,79E-03 | MNR | MNR | MNR | 1,26E-01 | MNR | MNR | 4,63E-07 | 1,01E-04 | 1,01E-09 | -2,63E-02 |
| ADP-fossil resources | MJ | 9,70E+02 | 1,90E+01 | 4,65E+01 | 1,04E+03 | 1,61E+01 | 3,63E-01 | MNR | 8,99E+02 | MNR | MNR | MNR | 3,02E+05 | MNR | MNR | 2,97E+00 | 1,24E+01 | 1,20E-02 | -1,69E+03 |
| Water use[5)] | $m^3$e depr. | 4,42E+02 | 8,99E-02 | 1,27E+00 | 4,44E+02 | 7,53E-02 | 9,24E-03 | MNR | 2,63E+01 | MNR | MNR | MNR | 6,50E+03 | MNR | MNR | 1,33E-02 | 4,12E-01 | 3,81E-05 | -2,79E+01 |

*1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.*

## ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Particulate matter | Incidence | 2,44E-05 | 1,04E-07 | 2,01E-07 | 2,47E-05 | 8,71E-08 | 1,04E-08 | MNR | 1,32E-06 | MNR | MNR | MNR | 2,52E-04 | MNR | MNR | 2,28E-08 | 1,65E-07 | 8,30E-11 | -1,10E-05 |
| Ionizing radiation[6)] | kBq U235e | 1,45E+01 | 9,98E-02 | 1,09E+00 | 1,57E+01 | 8,44E-02 | 2,27E-03 | MNR | 1,87E+00 | MNR | MNR | MNR | 1,45E+04 | MNR | MNR | 1,41E-02 | 8,56E-02 | 5,43E-05 | -6,54E+00 |
| Ecotoxicity (freshwater) | CTUe | 1,96E+04 | 1,60E+01 | 7,16E+01 | 1,97E+04 | 1,34E+01 | 5,28E+00 | MNR | 4,91E+02 | MNR | MNR | MNR | 1,98E+05 | MNR | MNR | 2,67E+00 | 7,02E+01 | 7,84E-03 | -1,01E+04 |
| Human toxicity, cancer | CTUh | 8,29E-07 | 5,28E-10 | 1,39E-09 | 8,31E-07 | 4,13E-10 | 1,14E-10 | MNR | 1,82E-08 | MNR | MNR | MNR | 6,02E-06 | MNR | MNR | 6,56E-11 | 2,23E-09 | 1,96E-13 | 2,32E-07 |
| Human tox. non-cancer | CTUh | 2,35E-05 | 1,58E-08 | 3,46E-08 | 2,35E-05 | 1,31E-08 | 1,18E-09 | MNR | 4,36E-07 | MNR | MNR | MNR | 1,46E-04 | MNR | MNR | 2,64E-09 | 8,23E-08 | 5,12E-12 | -1,87E-05 |
| SQP[7)] | - | 8,41E+02 | 1,33E+01 | 8,60E+01 | 9,41E+02 | 1,14E+01 | 2,53E-01 | MNR | 1,06E+02 | MNR | MNR | MNR | 9,70E+04 | MNR | MNR | 3,42E+00 | 2,62E+01 | 2,57E-02 | -7,09E+02 |

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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; 7) SQP = Land use related impacts/soil quality.

## USE OF NATURAL RESOURCES

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Renew. PER as energy[8)] | MJ | 6,27E+02 | 2,81E-01 | 2,69E+01 | 6,54E+02 | 2,34E-01 | 2,38E-02 | MNR | 5,60E+01 | MNR | MNR | MNR | 7,42E+04 | MNR | MNR | 3,34E-02 | 1,81E+00 | 1,04E-04 | -8,23E+01 |
| Renew. PER as material | MJ | 3,57E-01 | 0,00E+00 | 1,59E+01 | 1,63E+01 | 0,00E+00 | -1,59E+01 | MNR | 0,00E+00 | MNR | MNR | MNR | 0,00E+00 | MNR | MNR | 0,00E+00 | -3,57E-01 | 0,00E+00 | 0,00E+00 |
| Total use of renew. PER | MJ | 6,27E+02 | 2,81E-01 | 4,28E+01 | 6,70E+02 | 2,34E-01 | -1,59E+01 | MNR | 5,60E+01 | MNR | MNR | MNR | 7,42E+04 | MNR | MNR | 3,34E-02 | 1,45E+00 | 1,04E-04 | -8,23E+01 |
| Non-re. PER as energy | MJ | 3,06E+03 | 1,90E+01 | 4,64E+01 | 3,13E+03 | 1,61E+01 | 3,63E-01 | MNR | 5,00E+02 | MNR | MNR | MNR | 3,02E+05 | MNR | MNR | 2,97E+00 | 1,24E+01 | 1,20E-02 | -1,68E+03 |
| Non-re. PER as material | MJ | 8,04E+01 | 0,00E+00 | 1,33E-01 | 8,05E+01 | 0,00E+00 | -1,33E-01 | MNR | 0,00E+00 | MNR | MNR | MNR | 0,00E+00 | MNR | MNR | 0,00E+00 | -8,04E+01 | 0,00E+00 | 0,00E+00 |
| Total use of non-re. PER | MJ | 3,14E+03 | 1,90E+01 | 4,65E+01 | 3,21E+03 | 1,61E+01 | 2,30E-01 | MNR | 5,00E+02 | MNR | MNR | MNR | 3,02E+05 | MNR | MNR | 2,97E+00 | -6,80E+01 | 1,20E-02 | -1,68E+03 |
| Secondary materials | kg | 6,35E+00 | 6,54E-03 | 1,09E+00 | 7,45E+00 | 5,48E-03 | 6,81E-04 | MNR | 1,58E+00 | MNR | MNR | MNR | 2,53E+01 | MNR | MNR | 8,24E-04 | 1,49E-02 | 2,52E-06 | 3,14E+01 |
| Renew. secondary fuels | MJ | 1,97E-01 | 7,17E-05 | 7,82E-02 | 2,75E-01 | 6,03E-05 | 3,37E-06 | MNR | 9,93E-02 | MNR | MNR | MNR | 1,15E-01 | MNR | MNR | 8,31E-06 | 7,54E-04 | 6,59E-08 | -6,58E-02 |
| Non-ren. secondary fuels | MJ | 1,37E-01 | 0,00E+00 | 0,00E+00 | 1,37E-01 | 0,00E+00 | 0,00E+00 | MNR | 0,00E+00 | MNR | MNR | MNR | 0,00E+00 | MNR | MNR | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Use of net fresh water | $m^3$ | 2,97E+00 | 2,44E-03 | 4,40E-02 | 3,02E+00 | 2,05E-03 | 2,04E-04 | MNR | 3,22E-01 | MNR | MNR | MNR | 2,68E+02 | MNR | MNR | 3,84E-04 | 1,32E-02 | 1,32E-05 | -6,68E-01 |

*8) PER = Primary energy resources.*

## END OF LIFE – WASTE

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hazardous waste | kg | 3,25E+01 | 2,21E-02 | 2,01E-01 | 3,27E+01 | 1,83E-02 | 3,27E-03 | MNR | 1,46E+00 | MNR | MNR | MNR | 6,67E+02 | MNR | MNR | 3,93E-03 | 9,30E-02 | 0,00E+00 | -3,42E+01 |
| Non-hazardous waste | kg | 5,96E+02 | 3,95E-01 | 7,35E+00 | 6,04E+02 | 3,25E-01 | 8,90E-02 | MNR | 6,13E+01 | MNR | MNR | MNR | 1,70E+04 | MNR | MNR | 6,46E-02 | 4,55E+00 | 8,32E-02 | -6,98E+02 |
| Radioactive waste | kg | 1,82E-02 | 1,30E-04 | 2,88E-04 | 1,86E-02 | 1,11E-04 | 1,57E-06 | MNR | 1,26E-03 | MNR | MNR | MNR | 3,18E+00 | MNR | MNR | 1,99E-05 | 5,20E-05 | 0,00E+00 | -2,90E-03 |

## END OF LIFE – OUTPUT FLOWS

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Components for re-use | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | MNR | 0,00E+00 | MNR | MNR | MNR | 0,00E+00 | MNR | MNR | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Materials for recycling | kg | 2,64E-03 | 0,00E+00 | 5,32E+00 | 5,32E+00 | 0,00E+00 | 1,18E+00 | MNR | 0,00E+00 | MNR | MNR | MNR | 0,00E+00 | MNR | MNR | 0,00E+00 | 4,04E+01 | 0,00E+00 | 0,00E+00 |
| Materials for energy rec | kg | 1,34E-04 | 0,00E+00 | 0,00E+00 | 1,34E-04 | 0,00E+00 | 4,98E-02 | MNR | 0,00E+00 | MNR | MNR | MNR | 0,00E+00 | MNR | MNR | 0,00E+00 | 2,03E+00 | 0,00E+00 | 0,00E+00 |
| Exported energy | MJ | 8,47E-01 | 0,00E+00 | 0,00E+00 | 8,47E-01 | 0,00E+00 | 4,76E-01 | MNR | 4,69E+00 | MNR | MNR | MNR | 0,00E+00 | MNR | MNR | 0,00E+00 | 5,00E+01 | 0,00E+00 | 0,00E+00 |

## ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Warming Pot. | kg $CO_2$e | 2,12E+02 | 1,26E+00 | 2,99E+00 | 2,16E+02 | 1,07E+00 | 6,19E-02 | MNR | 4,13E+01 | MNR | MNR | MNR | 9,96E+03 | MNR | MNR | 1,96E-01 | 5,88E+00 | 4,29E-04 | -1,67E+02 |
| Ozone depletion Pot. | kg $CFC_{-11}$e | 2,61E-05 | 2,33E-07 | 1,93E-07 | 2,65E-05 | 1,99E-07 | 2,68E-09 | MNR | 1,98E-06 | MNR | MNR | MNR | 4,98E-04 | MNR | MNR | 3,60E-08 | 8,92E-08 | 1,40E-10 | -5,21E-06 |
| Acidification | kg $SO_2$e | 3,36E+00 | 3,09E-03 | 1,50E-02 | 3,38E+00 | 2,52E-03 | 1,33E-04 | MNR | 1,29E-01 | MNR | MNR | MNR | 3,65E+01 | MNR | MNR | 6,50E-04 | 9,20E-03 | 3,11E-06 | -1,92E+00 |
| Eutrophication | kg $PO_4^{3}$e | 6,79E-01 | 6,77E-04 | 6,55E-03 | 6,86E-01 | 5,44E-04 | 2,90E-04 | MNR | 5,42E-02 | MNR | MNR | MNR | 1,55E+01 | MNR | MNR | 1,48E-04 | 4,11E-03 | 6,71E-07 | -5,16E-01 |
| POCP (“smog”) | kg $C_2H_4$e | 1,72E-01 | 1,59E-04 | 7,39E-04 | 1,73E-01 | 1,27E-04 | 2,14E-05 | MNR | 8,68E-03 | MNR | MNR | MNR | 1,64E+00 | MNR | MNR | 2,54E-05 | 3,66E-04 | 1,30E-07 | -1,04E-01 |
| ADP-elements | kg Sbe | 2,23E-01 | 4,88E-06 | 1,05E-05 | 2,23E-01 | 3,82E-06 | 4,53E-07 | MNR | 1,79E-03 | MNR | MNR | MNR | 1,26E-01 | MNR | MNR | 4,49E-07 | 1,01E-04 | 9,92E-10 | -2,63E-02 |
| ADP-fossil | MJ | 3,08E+03 | 1,90E+01 | 4,54E+01 | 3,14E+03 | 1,61E+01 | 3,63E-01 | MNR | 8,98E+02 | MNR | MNR | MNR | 2,87E+05 | MNR | MNR | 2,97E+00 | 1,24E+01 | 1,20E-02 | -1,69E+03 |

# VERIFICATION STATEMENT

## VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with reference standard, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The digital background data for this EPD

Why does verification transparency matter? Read more online
This EPD has been generated by One Click LCA EPD generator, which has been verified and approved by the EPD Hub.

## THIRD-PARTY VERIFICATION STATEMENT

I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of the data collected and used in the LCA calculations, the way the LCA-based calculations have been carried out, the presentation of environmental data in the EPD, and other additional environmental information, as present with respect to the procedural and methodological requirements in ISO 14025:2010 and reference standard.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

Imane Uald lamkaddam, as an authorized verifier acting for EPD Hub Limited

23.08.2024