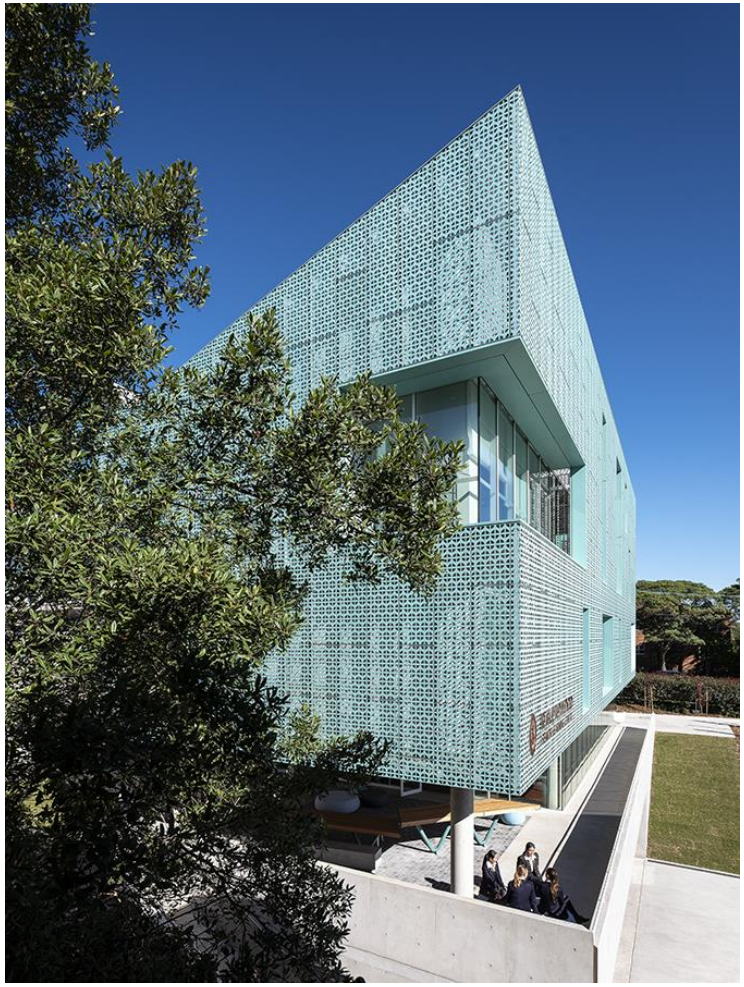
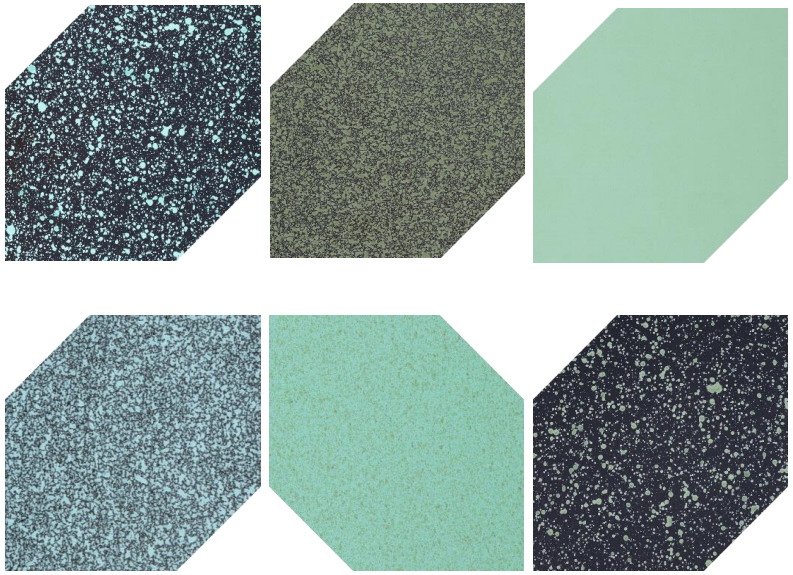
ENVIRONMENTAL PRODUCT DECLARATION

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



Nordic Green / Blue
Copper and copper alloys - sheet and strip for building purposes
Aurubis Finland Oy



Nordic Copper

EPD HUB, HUB-0256
Publishing date 27 January 2023, last updated date 27 January 2023,
valid until 27 January 2028

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Aurubis Finland Oy
Address	P.O.Box 60, 28101 Pori, Finland
Contact details	NordicCopper@aurubis.com
Website	https://www.aurubis.fi, https://www.nordiccopper.com

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804+A2:2019 and ISO 14025
PCR	EPD Hub Core PCR version 1.0, 1 Feb 2022
Sector	Construction product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with options, A4-A5, and modules C1-C4 and D
EPD author	Afry Finland Oy, Riikka Anttonen, Laura Sariola
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
EPD verifier	H.H, 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	Nordic Green / Blue / Turquoise
Additional labels	Nordic Copper, Pre-patinated copper Architectural Copper Sheet and Strip
Product reference	-
Place of production	Finland
Period for data	2021

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 kg
Declared unit mass	1 kg
GWP-fossil, A1-A3 (kgCO2e)	0.572
GWP-total, A1-A3 (kgCO2e)	0.523
Secondary material, inputs (%)	0.611
Secondary material, outputs (%)	99.9
Total energy use, A1-A3 (kWh)	3.34
Total water use, A1-A3 (m3e)	0.00499

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Aurubis Finland Oy is part of the German Aurubis Group, which operates in numerous countries around the world. With over 150 years of experience, Aurubis is the Europe's largest copper producer and one of the world's leading copper recyclers. The products are manufactured in the only copper foundry and rolling mill in the Nordic countries and are used, for example, in electric cars, wind turbines and architectural solutions around the world.

PRODUCT DESCRIPTION

The Nordic Green and Nordic Blue products consist of 100% recycled Cu-DHP according to /EN 1172/, i.e. oxygen free phosphorus de-oxidised copper with limited residual phosphorus. The Nordic Green product is surface treated with copper oxide layer and artificial patina. The oxide layer consists of Cu2O and CuO oxides. The oxide is covered by mineral based patina, Cu4(SO4)OH6, with greenish color in case of Nordic Green or bluish color in case of Nordic Blue. Nordic Green and Nordic Blue are available in sheets or coils with one surface treated.

Dimension:

Width range	max 1000 mm
Thickness	0.5 – 1.5 mm
Coils	max 3750 kg
Sheet length	max 6000 mm

Chemical Composition %:

Copper (Cu)	99.90 (min.)
Phosphorus (P)	0.015 - 0.040

Surface: mineral based patina, Cu4(SO4)OH6, with greenish colour.

Density 8.94 kg/dm3

Typical use of the product is architectural, eg. for external/internal cladding like roofing, facades and decoration.

Further information can be found at https://www.aurubis.fi, https://www.nordiccopper.com.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	99.90 (min.)	Finland
Minerals	0.015 - 0.040	Finland
Fossil materials	-	-
Bio-based materials	-	-

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	-
Biogenic carbon content in packaging, kg C	0.015

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 kg
Mass per declared unit	1 kg
Functional unit	-
Reference service life	> 100 years

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		
x	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	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.

The product is made of recycled oxygen-free phosphorus de-oxidised copper with limited residual phosphorus. The raw material is 100% scrap copper. Product manufacturing clippings are an integral part of the production and fully recycled back into the process.

The raw material is imported from the same property (<1 km) or from a local supplier (<50km) by a truck. For raw material transport (A2) an occupancy rate of 50% is assumed.

In the manufacturing process the raw material scrap is delivered to the copper foundry in Pori for melting and casting. Copper slabs from the foundry go to the rolling mill for further processing. In the rolling mill the product goes through the basic process steps described in the flowchart (p. 6) , after which it is cut, slit and packed.

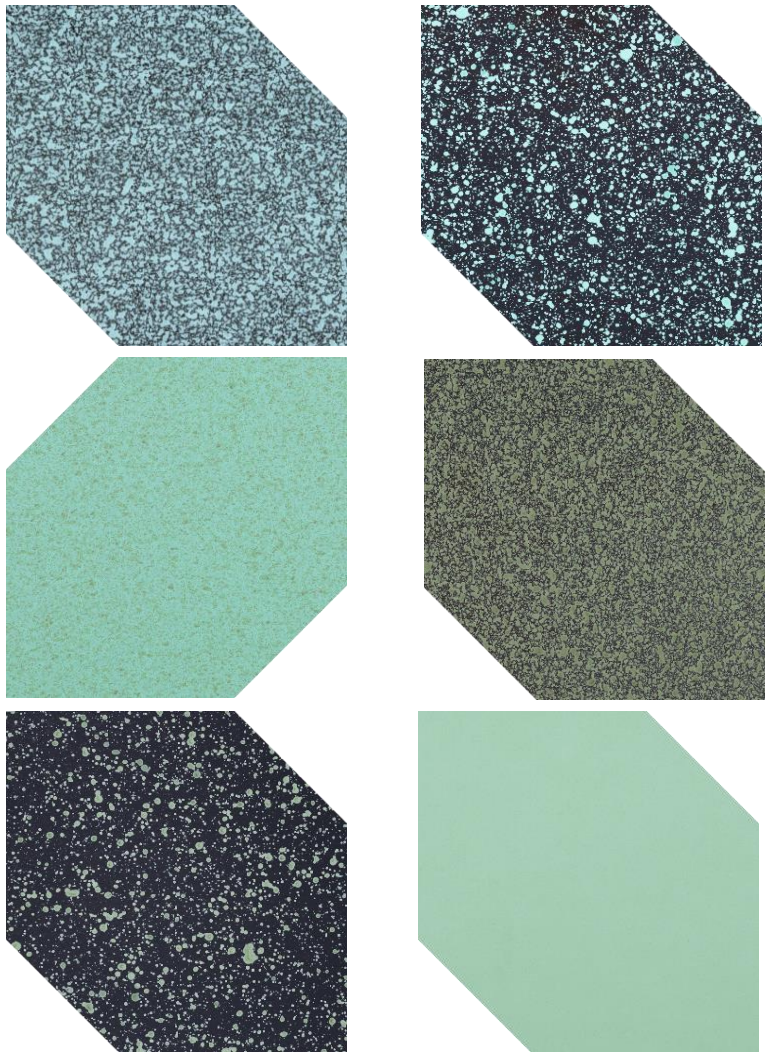
Manufacturing requires fuels, energy for electricity and heating of production facilities (A3). Ancillary materials like process chemicals are used. Moulds, machinery and equipment are counted as capital goods and are not taken into consideration in the calculation. Waste generated at the production facility is recycled.

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.

Products are delivered globally and the average distance to the building site is estimated to be 1500 km. Approximately 10% of the transportation is by sea. Road haulage is carried out by > 32 t lorries. For product deliveries an occupancy rate of 100% is assumed. Transportation losses are assessed as insignificant (<1%).

During the installation phase (A5), the product is assumed to be fixed with screws. Due to variations in the appearance of the product (sheets or strips) and in the method of installation, the possible need for a crane or similar machine work is not taken into account. Packaging waste from installation is accounted for.



Alternative finishing for Nordic Green / Blue products.

PRODUCT USE AND MAINTENANCE (B1-B7)

This EPD does not cover the use phase.

PRODUCT END OF LIFE (C1-C4, D)

At the end of the life cycle, the product is dismantled. A high end-of-life recycling rate (99,9%) is assumed because the product can be dismantled intact and is made of recyclable high purity copper with a significant market value.

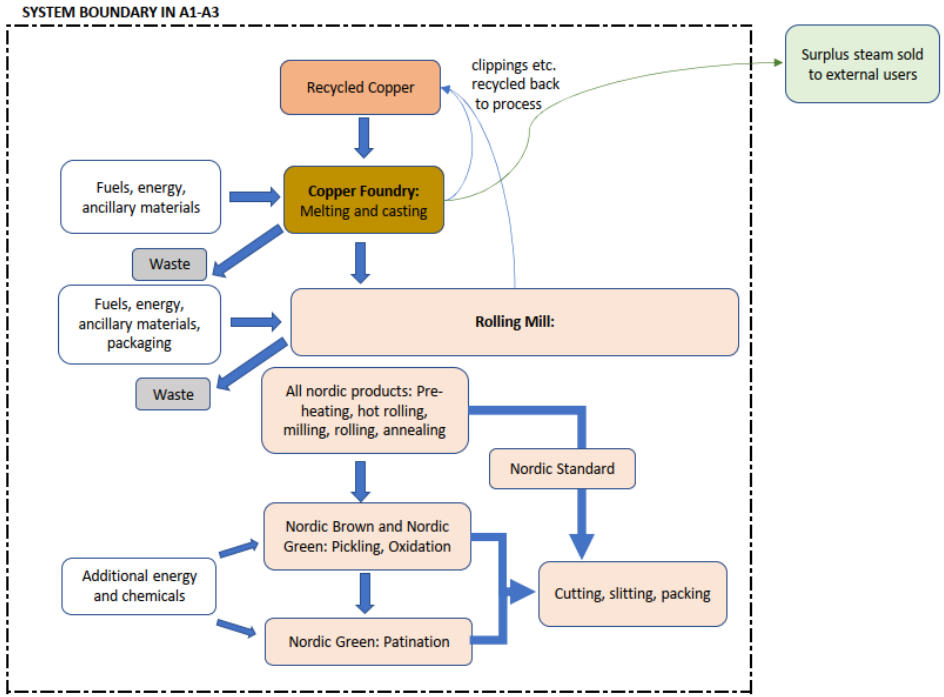
The impacts cover the use of energy to dismantle the copper sheet with an electric drill (C1). The dismantled waste material is transported to the closest facility for recycling (C2). The assumption for an average distance and transport method is estimated to be 50 km by truck (C2). Except some sorting / handling, the product requires no pre-treatment and can be directly transferred to melting and reprocessing at foundry (C3).

Due to the price and the high demand of the raw material, the share of dismantled material to be disposed of in landfills is estimated to be negligible (C4).

The benefits of copper recycling are included in the raw material phase (A1) and are therefore not considered in the end of life (D). The benefits from recycling and energy recovery of packaging materials are accounted for in module D.

MANUFACTURING PROCESS

The flowchart describing the manufacturing of all Nordic products.



Copper rolls before cutting.

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	Allocated by mass or volume
Packaging materials	Allocated by mass or volume
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

AVERAGES AND VARIABILITY

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. Ecoinvent and One Click LCA databases were used 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_2e	1,71E-2	2,96E-3	5,03E-1	5,23E-1	1,27E-1	1,08E-1	MND	MND	MND	MND	MND	MND	MND	8,52E-5	1,74E-2	2,68E-2	5,28E-6	-8,15E-2
GWP – fossil	kg CO_2e	1,7E-2	2,96E-3	5,52E-1	5,72E-1	1,28E-1	9,58E-3	MND	MND	MND	MND	MND	MND	MND	8,32E-5	1,74E-2	2,85E-2	5,27E-6	-7,99E-2
GWP – biogenic	kg CO_2e	1,06E-4	1,94E-6	-5,07E-2	-5,06E-2	9,18E-5	9,8E-2	MND	MND	MND	MND	MND	MND	MND	1,11E-6	6,67E-6	-1,69E-3	1,04E-8	-1,61E-3
GWP – LULUC	kg CO_2e	6,84E-6	9,71E-7	1,9E-3	1,91E-3	3,92E-5	1,35E-6	MND	MND	MND	MND	MND	MND	MND	9,21E-7	6,44E-6	3,35E-5	1,56E-9	-8,19E-6
Ozone depletion pot.	kg $CFC_{-11}e$	3,97E-9	6,89E-10	8,5E-8	8,97E-8	3,02E-8	2,13E-10	MND	MND	MND	MND	MND	MND	MND	1,15E-11	3,77E-9	3,48E-9	2,17E-12	-5,28E-9
Acidification potential	mol H^+e	1,08E-4	1,84E-5	5,99E-3	6,12E-3	5,81E-4	1,06E-5	MND	MND	MND	MND	MND	MND	MND	3,37E-7	7,21E-5	3,16E-4	5E-8	-6,53E-4
EP-freshwater[2)]	kg Pe	2,88E-7	2,33E-8	4,58E-5	4,61E-5	1,04E-6	2,08E-8	MND	MND	MND	MND	MND	MND	MND	4,01E-9	1,7E-7	1,65E-6	6,36E-11	-2,14E-6
EP-marine	kg Ne	3,54E-5	5,15E-6	4,9E-4	5,31E-4	1,72E-4	4,28E-6	MND	MND	MND	MND	MND	MND	MND	5,7E-8	2,1E-5	7,01E-5	1,72E-8	-7,94E-5
EP-terrestrial	mol Ne	3,91E-4	5,7E-5	6,42E-3	6,86E-3	1,91E-3	4,56E-5	MND	MND	MND	MND	MND	MND	MND	7,09E-7	2,32E-4	8,07E-4	1,9E-7	-8,61E-4
POCP ("smog")[3)]	kg NMVOCe	1,21E-4	1,72E-5	1,85E-3	1,99E-3	6,05E-4	1,17E-5	MND	MND	MND	MND	MND	MND	MND	1,79E-7	7,06E-5	2,21E-4	5,51E-8	-2,53E-4
ADP-minerals & metals[4)]	kg Sbe	3,38E-7	4,85E-8	2,94E-5	2,97E-5	2,18E-6	2,84E-8	MND	MND	MND	MND	MND	MND	MND	2,82E-10	4,56E-7	1,4E-6	4,81E-11	-6,22E-8
ADP-fossil resources	MJ	3,07E-1	4,55E-2	9,87E0	1,02E1	1,99E0	1,78E-2	MND	MND	MND	MND	MND	MND	MND	2,54E-3	2,56E-1	3,5E-1	1,47E-4	-7,48E-1
Water use[5)]	m^3e depr.	8,32E-4	1,65E-4	1,78E-1	1,79E-1	7,39E-3	2,95E-4	MND	MND	MND	MND	MND	MND	MND	2,14E-5	9,82E-4	5,53E-3	6,81E-6	-3,59E-3

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	5,9E-3	5,57E-4	1,96E0	1,97E0	2,5E-2	1,16E-3	MND	MND	MND	MND	MND	MND	MND	7,89E-4	2,86E-3	4,84E-2	1,19E-6	-4,58E-2
Renew. PER as material	MJ	0E0	0E0	5,71E-1	5,71E-1	0E0	-5,71E-1	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Total use of renew. PER	MJ	5,9E-3	5,57E-4	2,53E0	2,54E0	2,5E-2	-5,7E-1	MND	MND	MND	MND	MND	MND	MND	7,89E-4	2,86E-3	4,84E-2	1,19E-6	-4,58E-2
Non-re. PER as energy	MJ	3,07E-1	4,55E-2	9,7E0	1,01E1	1,99E0	1,78E-2	MND	MND	MND	MND	MND	MND	MND	2,54E-3	2,56E-1	3,5E-1	1,47E-4	-7,48E-1
Non-re. PER as material	MJ	0E0	0E0	1,68E-1	1,68E-1	0E0	-1,68E-1	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Total use of non-re. PER	MJ	3,07E-1	4,55E-2	9,87E0	1,02E1	1,99E0	-1,5E-1	MND	MND	MND	MND	MND	MND	MND	2,54E-3	2,56E-1	3,5E-1	1,47E-4	-7,48E-1
Secondary materials	kg	0E0	0E0	6,11E-3	6,11E-3	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	-2,98E-4
Renew. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m^3	2,39E-4	9,17E-6	4,75E-3	0.00499	4,13E-4	2,89E-5	MND	MND	MND	MND	MND	MND	MND	7E-7	4,42E-5	1,48E-4	1,61E-7	-1,28E-4

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	4,86E-4	4,47E-5	3,1E-2	3,16E-2	1,94E-3	3,34E-4	MND	MND	MND	MND	MND	MND	MND	5,67E-6	3,35E-4	0E0	1,37E-7	-3,47E-3
Non-hazardous waste	kg	1E0	4,64E-3	2,73E0	3,74E0	2,13E-1	3,42E-2	MND	MND	MND	MND	MND	MND	MND	1,45E-4	1,86E-2	0E0	1E-3	-8,27E-2
Radioactive waste	kg	1,8E-6	3,13E-7	7,85E-5	8,06E-5	1,37E-5	1,04E-7	MND	MND	MND	MND	MND	MND	MND	2,66E-8	1,69E-6	0E0	9,74E-10	-2,31E-6

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	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	0E0	0E0	1,34E-4	1,34E-4	0E0	2,23E-3	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	9,99E-1	0E0	0E0
Materials for energy rec	kg	0E0	0E0	0E0	0E0	0E0	6,7E-2	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	5,4E-1	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0

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_2e	1,67E-2	2,94E-3	5,46E-1	5,65E-1	1,27E-1	9,56E-3	MND	MND	MND	MND	MND	MND	MND	8,19E-5	1,72E-2	2,79E-2	5,17E-6	-7,76E-2
Ozone depletion Pot.	kg CFC_{-11}e	3,17E-9	5,48E-10	8,12E-8	8,49E-8	2,4E-8	1,86E-10	MND	MND	MND	MND	MND	MND	MND	1,56E-11	2,99E-9	2,85E-9	1,72E-12	-4,19E-9
Acidification	kg SO_2e	5,14E-5	1,1E-5	5,35E-3	5,42E-3	2,97E-4	7,07E-6	MND	MND	MND	MND	MND	MND	MND	2,78E-7	5,33E-5	2E-4	2,08E-8	-5,75E-4
Eutrophication	kg PO_4^3e	1,42E-5	1,74E-6	1,99E-3	2,01E-3	5,64E-5	5,33E-6	MND	MND	MND	MND	MND	MND	MND	1,17E-7	1,22E-5	7,7E-5	4,03E-9	-8,38E-5
POCP (“smog”)	kg C_2H_4e	4,97E-6	4,96E-7	2,38E-4	2,43E-4	1,74E-5	2,16E-7	MND	MND	MND	MND	MND	MND	MND	1,15E-8	2,29E-6	9,27E-6	1,53E-9	-2,47E-5
ADP-elements	kg Sbe	3,38E-7	4,85E-8	2,94E-5	2,97E-5	2,18E-6	2,84E-8	MND	MND	MND	MND	MND	MND	MND	2,82E-10	4,56E-7	1,4E-6	4,81E-11	-6,22E-8
ADP-fossil	MJ	3,07E-1	4,55E-2	9,87E0	1,02E1	1,99E0	1,78E-2	MND	MND	MND	MND	MND	MND	MND	2,54E-3	2,56E-1	3,5E-1	1,47E-4	-7,48E-1

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.

HaiHa Nguyen, as an authorized verifier acting for EPD Hub Limited
27.01.2023

VERIFIED ISO 14025