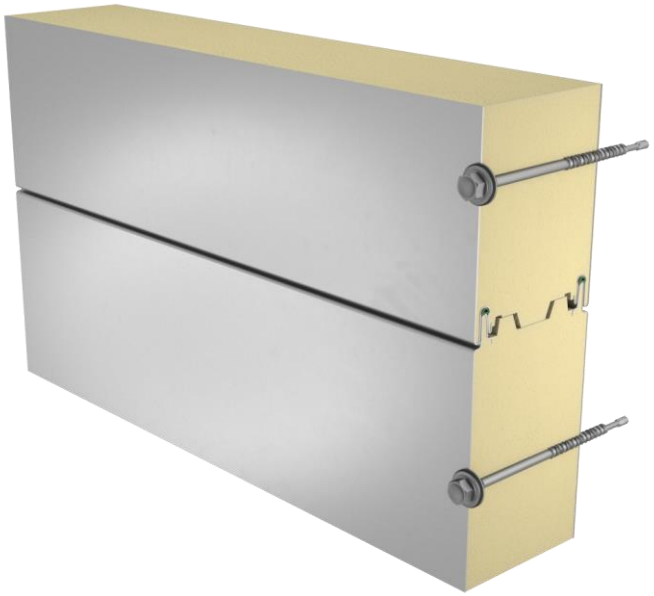
ENVIRONMENTAL PRODUCT DECLARATION

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

SP2B, SP2D, SP2E wall sandwich panels with 80 mm PIR core
Ruukki Construction



EPD HUB, HUB-0583
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GENERAL INFORMATION

MANUFACTURER

Manufacturer	Ruukki Construction
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Contact details	Mira Laukkanen, mira.laukkanen@ruukki.com
Website	https://www.ruukki.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	Sister EPD
Scope of the EPD	Cradle to gate with options, A4-B7, and modules C1-C4, D
EPD author	Mira Laukkanen, Ruukki Construction
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
EPD verifier	HaiHa Nguyen, 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	SP2B, SP2D, SP2E wall sandwich panels with 80 mm PIR core
Additional labels	Available in Energy version and different production variants.
Product reference	-
Place of production	Oborniki, Poland
Period for data	2021
Averaging in EPD	No averaging
Variation in GWP-fossil for A1-A3	- %

Results are valid for all steel thicknesses ranging from 0,5 mm / 0,4 mm to 0,6 mm / 0,6 mm.

ENVIRONMENTAL DATA SUMMARY

Functional unit	1 m2
Functional unit mass	11.01 kg
GWP-fossil, A1-A3 (kgCO2e)	3,06E1
GWP-total, A1-A3 (kgCO2e)	2,94E1
Secondary material, inputs (%)	6.91
Secondary material, outputs (%)	86.7
Total energy use, A1-A3 (kWh)	244.0
Total water use, A1-A3 (m3e)	3,25E0

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Ruukki makes steel-based products for walls and roofs, for both commercial buildings and private homes. Our strong presence in 10 European countries enables us to serve customers locally. We are of Nordic origin, part of SSAB, sharing values, and long experience in steel and construction industry. Information about the manufacturer can be found at https://www.ruukki.com/.

PRODUCT DESCRIPTION

These SP2B, SP2D and SP2E sandwich panels consist of polyisocyanurate foam (PIR) insulating core bonded between two colour-coated steel sheets. The sandwich panels are used for structural purposes for external walls, internal walls and ceilings. SP2B, SP2D and SP2E sandwich panels with PIR core are available in thicknesses ranging from 40 to 200 mm. This EPD applies to SP2B, SP2D and SP2E panels with 80 mm thick PIR insulation core.

Our selection of sandwich panels also includes Energy panels with extremely low air leakage rates. The term Energy refers to airtight energy efficient panel structures that is guaranteed by joint tightness and special tolerances in production. We also offer Patina sandwich panels that have an external facing made of natural and untreated Cor-Ten® steel.

Further information can be found at https://www.ruukki.com/.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	73,5	EU
Minerals	0	-
Fossil materials	26,5	EU
Bio-based materials	0	-

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	0.323

FUNCTIONAL UNIT AND SERVICE LIFE

Mass per functional unit	11.01 kg
Functional unit	1 m2 thermal insulation panels with R-value of 3,7 m2K/W
Reference service life	50 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	x	MND	MND	MND	MNR	MNR	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.

Panel facings are mainly made of colour-coated, hot-dip galvanised steel sheeting. Steel is an alloy of mainly iron and carbon, with small amounts of alloying elements. These elements improve the chemical and physical properties of steel such as strength, durability and corrosion resistance. The alloying elements of steel are closely linked to its chemical matrix. The steel density is 7 850 kg/m3. The zinc coating quantity is 275 g/m2, but lower zinc quantities may also be used, depending on end use application. The steel sheets used in the panels are typically coated with Hiarc or polyester on the external facing side and with polyester on the internal facing of the panel. Additionally, we offer special coatings and stainless steel options depending on the application and special weather resistance requirements.

The insulation core is made of rigid, HCFC-free and self-extinguishing polyisocyanurate (PIR) foam frothed with pentane. The foam density of the material is 35-39 kg/m3. Sandwich panels with PIR core are available in thicknesses ranging from 40 to 200 mm. Due to their extremely low thermal conductivity ratio, the sandwich panels result in thinner-than-average structures without compromising their insulation properties.

Sandwich panels that conform to this environmental product declaration are manufactured at Ruukki's plant in Oborniki, Poland. Raw materials are mostly transported to the production site by road. After manufacturing, the products are wrapped to protect them during handling and transport. A typical package consists of a wooden pallet, plastic straps, a plastic stretch wrap, corner pads made of cardboard or steel, plank wood and cardboard. Panel facings are protected with plastic wrap (PE) to protect the steel facings from mechanical damage during loading, unloading, storage and installation. PIR dust is produced during the manufacturing of the panels. This product loss and its treatment are taken into account. The PIR dust is assumed to be incinerated.

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.

Finished products are transported by truck and ship. Ruukki's logistics unit is responsible for most of the transportation of raw materials and products. Logistics aims to optimise transport, maximise payloads and combine transport as efficiently as possible. Environmental impacts for

transport of finished product to the building site (A4), have been calculated based on the weighted average of the market shares.

Installation of the product to the building (A5) includes an average of used electricity and diesel that machines consume during installation. It is assumed that installation of 1 m2 of sandwich panel consumes 0,37 kWh electricity and 15,6 MJ diesel. There is also estimated to be 2 % material loss during installation. The steel loss is assumed to be recycled by 95 % and the rest 5 % of steel loss is assumed to go to landfill. The rates for steel are based on World Steel Association, 2020. Waste management of PIR loss and packaging materials are also included in A5. Based on Plastics Europe 2022, 47 % of PIR and packaging plastics is assumed to be recycled, 32 % is incinerated and 21 % is landfilled. Packaging cardboard is assumed to be recycled. Packaging pallets are assumed to be incinerated with 73 % efficiency.

PRODUCT USE AND MAINTENANCE (B1-B7)

Maintenance B2 is included in the EPD. The maintenance includes washing and painting the external wall. The wall is estimated to be washed four times and painted once with a double layer during the reference service life. It is assumed that lifter consumes 0,5 kWh electricity per 1 m2 of panel during the reference service life. The reference service life presents an estimated life in normal outdoor and indoor conditions with maximum corrosivity category C3.
Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

The deconstruction of the sandwich panels was calculated based on data provided directly by EkoExpert, the supplier that provides Ruukki the service of disposal of their waste panels. According to the information collected from EkoExpert, the main input for dismantling the panels into different waste streams is the electricity to power the tools required. According to their estimations, approximately 0,89 MJ of electricity are needed per square meter of panel dismantled. After dismantling, the waste is transported to waste processing. The new paint layer added during use phase B2 is taken into account when calculating the amount of waste to end-of-life. Transport to waste processing is assumed to be 50 km by truck.

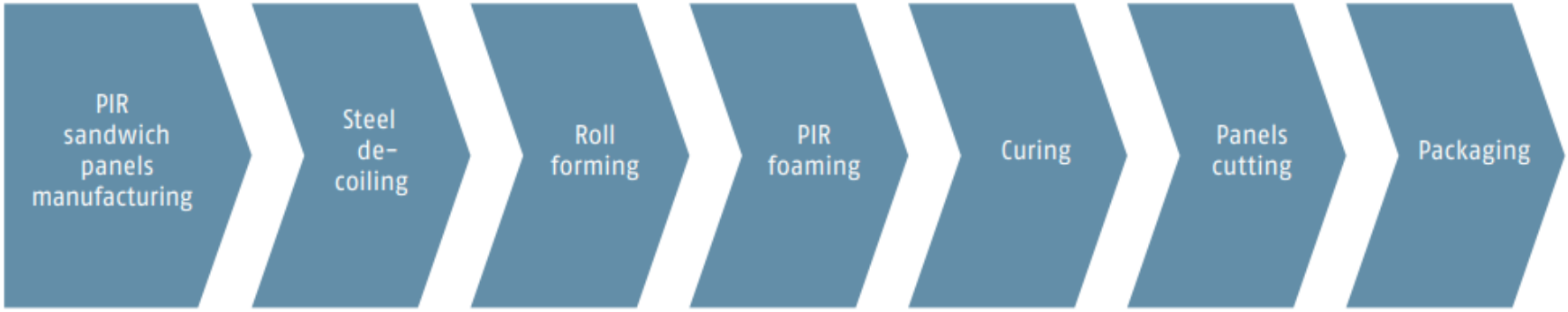
Waste materials from demolition are sorted and steel scrap is cycled back to the steel industry by the scrap trade. Scrap steel has a strong market position: an average of 95 % of the steel removed from buildings at the end of their life cycle is used in the production of new steel. Ruukki's PIR sandwich panels can be recycled and it is recommended that panels are sent to a reclamation facility where steel can be separated from the insulation core. Undamaged sandwich panels can be reused in less demanding applications. Damaged sandwich elements can be dismantled – steel is an important and fully recyclable raw material in new construction.

PIR insulation core is recyclable. The material is either sorted at source and ground down, or extruded for use as a raw material in new products. At the end of their useful life, polyisocyanurates can be sent for reuse or chemical recycling, or can be incinerated for energy recovery.

In this EPD, the end of life calculation is made with 95 % recycling rate for steel. 5 % of steel is estimated to go to landfill. For PIR foam, the used recycling rate is 25 % and incineration rate is 45 %. 30 % of PIR is assumed to go to landfill. The rates for steel are based on World Steel Association, 2020. The rates for PIR are based on Plastics Europe, 2022.

The benefits and loads of recycling and incineration (in modules A5 and C) are included in module D.

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 materials	Allocated by mass or volume
Ancillary materials	Not applicable
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. 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	2,79E1	1,42E0	8,75E-2	2,94E1	7,48E-1	3,8E0	MND	1,2E0	MND	MND	MND	MND	MND	1,18E-1	5,09E-2	3,9E0	1,1E-1	-1,82E1
GWP – fossil	kg CO_2e	2,82E1	1,41E0	9,91E-1	3,06E1	7,54E-1	2,61E0	MND	1,1E0	MND	MND	MND	MND	MND	1,14E-1	5,09E-2	3,9E0	1,1E-1	-1,9E1
GWP – biogenic	kg CO_2e	-2,61E-1	1,18E-3	-9,04E-1	-1,16E0	5,23E-4	1,19E0	MND	-1,23E-1	MND	MND	MND	MND	MND	4,26E-3	3,7E-5	7,55E-4	1,32E-4	8,03E-1
GWP – LULUC	kg CO_2e	1,59E-2	6,08E-4	9,69E-4	1,75E-2	2,36E-4	6,77E-4	MND	2,24E-1	MND	MND	MND	MND	MND	1,77E-4	1,53E-5	4,15E-4	1,63E-5	-1,39E-2
Ozone depletion pot.	kg CFC_{-11}e	6,33E-9	3,02E-7	7,47E-8	3,83E-7	1,76E-7	3,35E-7	MND	1,27E-7	MND	MND	MND	MND	MND	9,2E-9	1,2E-8	6,41E-8	4,29E-9	-7,53E-7
Acidification potential	mol H^+e	7,26E-2	6,81E-3	6E-3	8,54E-2	3,86E-3	1,91E-2	MND	1,41E-2	MND	MND	MND	MND	MND	6,49E-4	2,14E-4	6,12E-3	1,44E-4	-1,09E-1
EP-freshwater[2)]	kg Pe	7,92E-5	1,65E-5	3,4E-5	1,3E-4	6,05E-6	5,71E-5	MND	8,28E-5	MND	MND	MND	MND	MND	1,44E-5	4,14E-7	1,84E-5	4,64E-7	-1,12E-3
EP-marine	kg Ne	1,8E-2	1,92E-3	9,31E-4	2,08E-2	1,12E-3	7,4E-3	MND	1,89E-3	MND	MND	MND	MND	MND	7,68E-5	6,44E-5	2,43E-3	1,08E-3	-1,93E-2
EP-terrestrial	mol Ne	2E-1	2,12E-2	1,66E-2	2,38E-1	1,24E-2	8,12E-2	MND	1,23E-2	MND	MND	MND	MND	MND	9,65E-4	7,11E-4	2,44E-2	5,13E-4	-2,2E-1
POCP ("smog")[3)]	kg NMVOCe	5,6E-2	6,33E-3	3,71E-3	6,61E-2	3,84E-3	2,24E-2	MND	4,72E-3	MND	MND	MND	MND	MND	2,42E-4	2,29E-4	6,23E-3	1,62E-4	-9,01E-2
ADP-minerals & metals[4)]	kg Sbe	1,33E-3	2,42E-5	6,69E-6	1,36E-3	1,26E-5	3,12E-5	MND	2,06E-5	MND	MND	MND	MND	MND	8,44E-7	8,68E-7	1,52E-5	1,43E-7	-3,96E-2
ADP-fossil resources	MJ	4,63E2	1,51E1	1,82E1	4,96E2	1,17E1	3,46E1	MND	2,17E1	MND	MND	MND	MND	MND	2,23E0	7,92E-1	7,05E0	3,61E-1	-2,18E2
Water use[5)]	m^3e depr.	-4,56E0	8,65E-2	3,15E-1	-4,16E0	4,29E-2	1,84E-2	MND	7,75E-1	MND	MND	MND	MND	MND	2,97E-2	2,94E-3	3,17E-1	1,46E-2	-8,56E0

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.

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[6)]	MJ	5,01E1	6,17E-1	5,8E0	5,65E1	1,45E-1	1,62E0	MND	5,14E0	MND	MND	MND	MND	MND	3,71E-1	9,96E-3	5,52E-1	1,17E-2	-2,72E1
Renew. PER as material	MJ	1,8E-6	0E0	1,14E1	1,14E1	0E0	-1,14E1	MND	0E0	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	9,04E-2
Total use of renew. PER	MJ	5,01E1	6,17E-1	1,72E1	6,79E1	1,45E-1	-9,77E0	MND	5,14E0	MND	MND	MND	MND	MND	3,71E-1	9,96E-3	5,52E-1	1,17E-2	-2,71E1
Non-re. PER as energy	MJ	7,74E2	3,51E1	1,32E1	8,22E2	1,17E1	4,11E1	MND	2,17E1	MND	MND	MND	MND	MND	2,23E0	7,92E-1	7,05E0	3,61E-1	-1,82E2
Non-re. PER as material	MJ	1,57E2	0E0	4,97E0	1,62E2	0E0	-4,98E0	MND	0E0	MND	MND	MND	MND	MND	0E0	0E0	-1,1E2	-4,64E1	-2,32E-1
Total use of non-re. PER	MJ	9,31E2	3,51E1	1,82E1	9,84E2	1,17E1	3,61E1	MND	2,17E1	MND	MND	MND	MND	MND	2,23E0	7,92E-1	-1,03E2	-4,61E1	-1,83E2
Secondary materials	kg	7,59E-1	0E0	1,48E-3	7,61E-1	0E0	1,52E-2	MND	2,07E-2	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	6,33E0
Renew. secondary fuels	MJ	2,74E-5	0E0	0E0	2,74E-5	0E0	5,48E-7	MND	0E0	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	-2,16E-2	0E0	0E0	-2,16E-2	0E0	-4,33E-4	MND	0E0	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m^3	3,24E0	6,46E-3	2,99E-3	3,25E0	2,39E-3	6,86E-2	MND	2,37E-2	MND	MND	MND	MND	MND	7,06E-4	1,65E-4	8,63E-3	3,56E-4	-2,8E-1

6) 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	7,45E-1	4,8E-2	6,5E-2	8,58E-1	1,14E-2	7,12E-2	MND	1,76E-1	MND	MND	MND	MND	MND	7,01E-3	7,69E-4	0E0	8,38E-4	-5,45E0
Non-hazardous waste	kg	3,03E0	2,77E0	1,28E0	7,08E0	1,23E0	2,7E0	MND	2,09E0	MND	MND	MND	MND	MND	6,54E-1	8,51E-2	0E0	1,45E0	-6,46E1
Radioactive waste	kg	1,12E-2	2,34E-4	2,8E-5	1,14E-2	8,01E-5	3,82E-4	MND	6,41E-5	MND	MND	MND	MND	MND	1,37E-5	5,43E-6	0E0	2,03E-6	-3,5E-4

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	0E0	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	2,19E-2	0E0	0E0	2,19E-2	0E0	2,19E-1	MND	0E0	MND	MND	MND	MND	MND	0E0	0E0	8,25E0	0E0	0E0
Materials for energy rec	kg	4,36E-3	0E0	3,6E-2	4,04E-2	0E0	5,96E-1	MND	0E0	MND	MND	MND	MND	MND	0E0	0E0	1,3E0	0E0	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	1,04E1	MND	0E0	MND	MND	MND	MND	MND	0E0	0E0	2,59E1	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	2,85E1	9,9E-1	9,83E-1	3,05E1	7,48E-1	2,59E0	MND	1,28E0	MND	MND	MND	MND	MND	1,12E-1	5,04E-2	3,89E0	8,05E-2	-1,82E1
Ozone depletion Pot.	kg CFC_{-11}e	7,34E-8	1,75E-7	6,09E-8	3,09E-7	1,4E-7	2,69E-7	MND	1,38E-7	MND	MND	MND	MND	MND	1,08E-8	9,51E-9	5,48E-8	3,45E-9	-6,93E-7
Acidification	kg SO_2e	5,68E-2	3,08E-3	4,41E-3	6,43E-2	2,12E-3	5,51E-3	MND	1,45E-2	MND	MND	MND	MND	MND	5,64E-4	1,04E-4	4,19E-3	1,05E-4	-1,03E-1
Eutrophication	kg PO_4^3e	7E-3	6,48E-4	1,28E-3	8,93E-3	3,7E-4	2,49E-3	MND	2,23E-3	MND	MND	MND	MND	MND	4,51E-4	2,09E-5	2,87E-3	1,1E-2	-4,7E-2
POCP (“smog”)	kg C_2H_4e	7,75E-3	1,53E-4	3,47E-4	8,25E-3	1,11E-4	4,62E-4	MND	7,37E-4	MND	MND	MND	MND	MND	2,16E-5	6,56E-6	1,47E-4	1,68E-5	-1,02E-2
ADP-elements	kg Sbe	1,33E-3	2,42E-5	6,69E-6	1,36E-3	1,26E-5	3,12E-5	MND	2,06E-5	MND	MND	MND	MND	MND	8,44E-7	8,68E-7	1,52E-5	1,43E-7	-3,96E-2
ADP-fossil	MJ	4,63E2	1,51E1	1,82E1	4,96E2	1,17E1	3,46E1	MND	2,17E1	MND	MND	MND	MND	MND	2,23E0	7,92E-1	7,05E0	3,61E-1	-2,18E2

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
13.07.2023