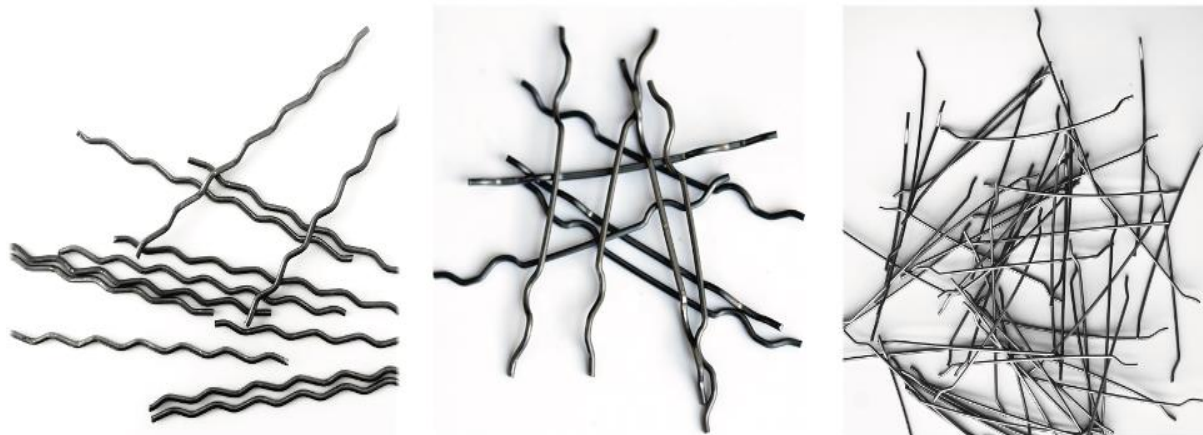


# ENVIRONMENTAL PRODUCT DECLARATION

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

## Steel fibres

SPAJIC doo



EPD HUB, HUB-0697

Publishing date 15 September 2023, last updated on 15 September 2023, valid until 15 September 2028

## GENERAL INFORMATION

### MANUFACTURER

Manufacturer	SPAJIC doo
Address	Koroglaska 13, Negotin, Serbia
Contact details	info@spajic.com
Website	www.spajic.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 (A1-A3) with end-of-life modules (C1-C4, D)
EPD author	Nina Mihajlović, SGS Beograd d.o.o.
EPD verification	Independent verification of this EPD and data, according to ISO 14025: <input type="checkbox"/> Internal certification <input checked="" type="checkbox"/> 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	Steel fibres
Additional labels	Steel fibres with hooked ends ZS/N, Corrugated steel fibres ZSW/N, High performance steel fibres ZS5/N
Product reference	/
Place of production	Negotin, Serbia
Period for data	2022 calendar year
Averaging in EPD	No averaging
Variation in GWP-fossil for A1-A3	0%

### ENVIRONMENTAL DATA SUMMARY

Declared unit	1 kg
Declared unit mass	1 kg
GWP-fossil, A1-A3 (kgCO <sub>2</sub> e)	2,57
GWP-total, A1-A3 (kgCO <sub>2</sub> e)	2,53
Secondary material, inputs (%)	21.6
Secondary material, outputs (%)	95.0
Total energy use, A1-A3 (kWh)	8.32
Total water use, A1-A3 (m <sup>3</sup> e)	2,21E-2

## PRODUCT AND MANUFACTURER

### ABOUT THE MANUFACTURER

Company SPAJIC doo is one of the leading manufacturers of steel fibres for reinforcement, drawn steel wire, cut wire shots and equipment. The company was established in 2002 and during all these years of existence, has strived to gain a worldwide reputation by good quality. Today, company takes pride in acquiring customers on every continent. The company produces four different types of steel fibres according to the intended application: steel fibres with hooked ends, high performance steel fibres, corrugated steel fibres and “micro steel fibres”.

### PRODUCT DESCRIPTION

Steel fibres covered by this study include steel fibres with hooked ends, corrugated steel fibres and high-performance steel fibres produced by SPAJIC doo. Fibre’s diameter range is from 0,55 to 1.05 and length from 30mm to 60mm. Steel fibres are produced in SPAJIC doo’s manufacturing plant in Negotin, Serbia.

SPAJIC steel fibres are used as concrete reinforcement, in combination with rebars or mesh, and can be used as a single structural component as well. By adding a certain quantity of fibres, the tensile and shear strength, impact strength and fatigue resistance of concrete is being increased.

Steel fibre reinforced concrete is an alternative to traditional reinforced concrete for certain application areas. Once they are mixed into the concrete, steel fibres become a discontinuous, 3-dimensionally oriented, isotropic reinforcement. Steel fibres bridge the crack at very small crack openings, transfer stresses and develop post crack strength in the concrete. Advantages of steel fibres in concrete are as follows:

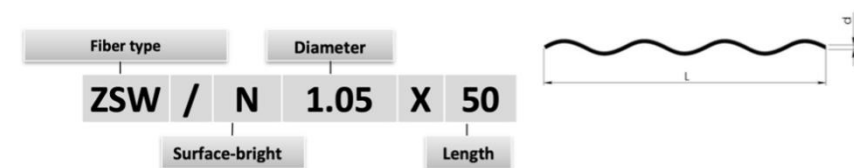
- Provision of multi-dimensional reinforcement
- Improvement of impact resistance of concrete

- Enhancement of durability and toughness of concrete
- High resistance and good ductility
- Crack control

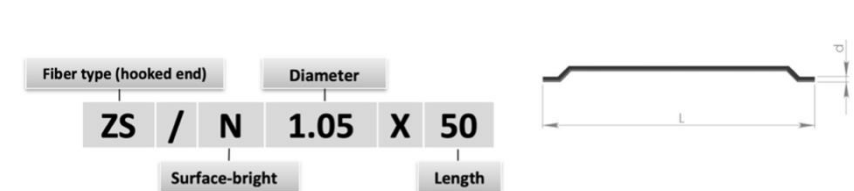
All three types of fibres covered by this study are produced by cold drawing of steel wire, go through the same production process and use the same amount of raw materials, with the only difference being the final shape of the fibre.

Product identification:

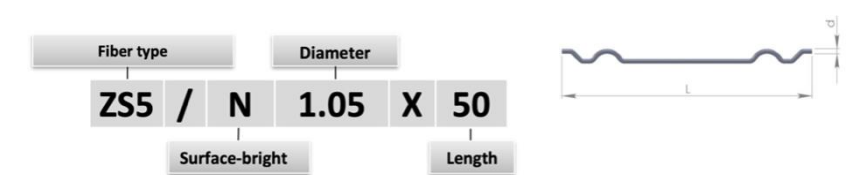
#### Corrugated steel fibres



#### Steel fibres with hooked ends



#### High performance steel fibres



Fibres covered by this EPD:

Fibre and surface type	Length (mm)	Diameter(mm)	Nominal Tensile Strength (N/mm <sup>2</sup> )
ZSW/N	30-60	0,55-1	1200-1350
ZS/N	30-60	0,55-1,05	1200-1350
ZS5/N	50-60	0,75-1	1200-1300

SPAJIC doo steel fibres are used all over the world and in various applications such as industrial flooring, shotcrete and tunnelling, foundation slabs, refractory concrete, hydro structures, precast elements, sprayed concrete linings, traffic areas and airport runways.

Further information can be found at [www.spajic.com](http://www.spajic.com).

### PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	100	Europe
Minerals	-	-
Fossil materials	-	-
Bio-based materials	-	-

### 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	0,0088

### FUNCTIONAL UNIT AND SERVICE LIFE

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

### 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	MND	MND	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.

SPAJIC doo steel fibres production starts with procurement of basic raw materials- wire rods. For the production of steel fibres, SPAJIC doo company uses hot-rolled steel wire rods of 5.5 mm diameter and of following steel grades: SAE 1006, SAE 1006+B, C4D+B and Fe37+B. SPAJIC doo purchases steel wire rods from suppliers from Moldova, Italy, Turkiye and Bosnia and Herzegovina, which are then shipped to the production site. The transportation of most materials involves multiple transport modalities, where route involves both transport by truck and ship.

First step of the production process is rough wire drawing from diameter 5.5mm to 2.4 or 2.00mm. The wires of diameter 2.4mm and 2.0mm then go through the fine wire drawing process. Steel wires with a diameter of 2.4mm are reduced to diameters 1.0, 0.9 and 0.75mm, whereas steel wires with a diameter of 2.0 are reduced to the diameter 0.6 and 0.55mm. In the wire drawing process, steel wire rods are pulled through conical dies, with an opening in the centre, which has a conical and a cylindrical part. As wire rod is pulled through the dies, it undergoes plastic deformation and gradual reduction in its diameter. At the same time, the length is increased proportionally. Wire drawing is a cold process, there is no change in the chemical composition of the wire, but only change in the diameter. After the wire drawing process, the next step is production of steel fibres. A wire is placed on the platform of the machine and inserted into the machine. The inserted wire is first being shaped and then cut to a certain length. Three types of fibres under this EPD: Steel fibres with hooked ends ZS/N, Corrugated steel fibres ZSW/N and High-performance steel fibres ZS5 all go through the same production process and are produced from the same raw materials and technology. The only difference is being achieved by the shape forming assembly, where steel fibre shape and length is being formed.

The production of packaging and ancillary materials is also modelled in this stage. Coating agent and wire drawing soaps are used in the manufacturing process in order to even out the wire drawing surface, make the wire drawing process more stable, enable higher drawing speed and reduce the friction between die and wire.

Production loss is 0,298% of declared unit and is modelled in A3. Steel wire rods that SPAJIC doo purchases are wrapped and packed with the hot-rolled steel wire rod that is considered as input packaging. Input packaging treatment is considered in A3. Treatment of packaging of ancillary

materials contributes less than 1% to total mass, and according to cut-off criteria, is excluded from the study.

Steel fibres with hooked ends ZS/N, Corrugated steel fibres ZSW/N and High-performance steel fibres ZS5 are packed in the same way. Pallets, paper sacks, cardboard, hook thread, stretch foil and PE foil are used for product packaging.

### **TRANSPORT AND INSTALLATION (A4-A5)**

This EPD does not cover product distribution and installation.

### **PRODUCT USE AND MAINTENANCE (B1-B7)**

This EPD does not cover the use phase.

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

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

Demolition is assumed to take 0,01 kWh/kg of product. The source of energy is diesel fuel used by construction machines (C1).

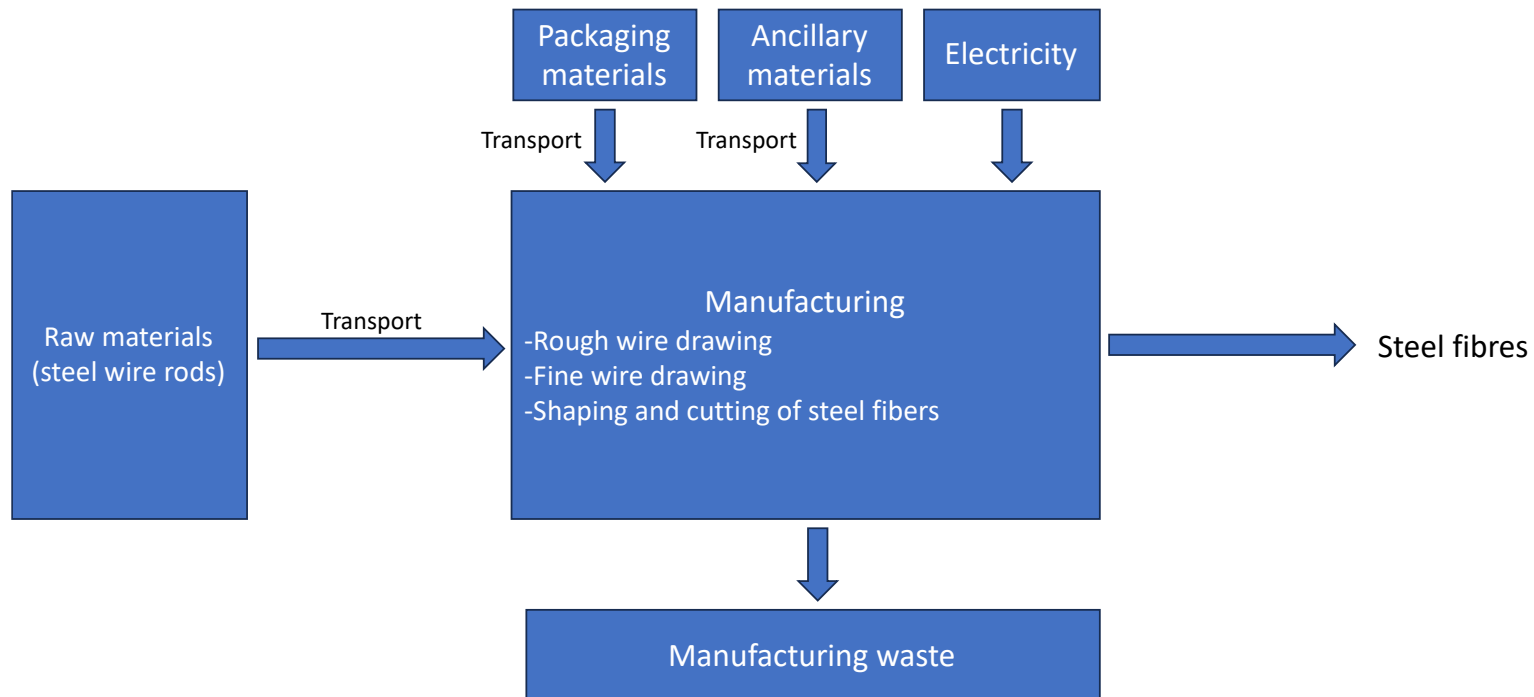
It is assumed that 100% of waste is collected. Transportation distance to recycling plant is assumed to be 250 km and to landfill is assumed to be 50 km. Transportation method is assumed to be lorry. Transport distances of waste to landfill and recycling facilities are retrieved from the EeBGuide (C2).

At the end of life, approximately 95% of steel fibres are assumed to be recycled based on World Steel Association, 2020 (C3). The remaining 5% of steel fibres is assumed to be taken to landfill for final disposal (C4).

Due to recycling process, the end-of-life product is converted into recycled steel (D).

Finished product is distributed and sold to clients all over the world. Since the packaging end of life is unknown, the conservative approach is taken. It is assumed that 100% of packaging pallet, plastic and paper is being sent to landfill.

## 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	No allocation
Ancillary materials	No allocation
Manufacturing energy and waste	No allocation


### AVERAGES AND VARIABILITY

Type of average	No averaging
Averaging method	Not applicable
Variation in GWP-fossil for A1-A3	0%

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 3.8 and One Click LCA databases were used as sources of environmental data.


 Created with One Click LCA



# 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 <sup>1)</sup>	kg CO <sub>2</sub> e	2,43E0	1,27E-1	-2,75E-2	2,53E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,31E-3	3,17E-2	2,09E-2	4,01E-2	-1,8E0
GWP – fossil	kg CO <sub>2</sub> e	2,43E0	1,27E-1	1,65E-2	2,57E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,31E-3	3,16E-2	2,08E-2	6,9E-4	-1,81E0
GWP – biogenic	kg CO <sub>2</sub> e	2,57E-3	5,49E-5	-4,41E-2	-4,15E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,32E-5	9,22E-5	3,94E-2	5,9E-3
GWP – LULUC	kg CO <sub>2</sub> e	1,23E-3	7,51E-5	1,5E-4	1,46E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,3E-7	1,29E-5	2,73E-5	6,5E-7	-3,53E-4
Ozone depletion pot.	kg CFC-11e	1,12E-7	2,88E-8	2,55E-9	1,43E-7	MND	MND	MND	MND	MND	MND	MND	MND	MND	7,07E-10	7,42E-9	2,57E-9	1,93E-10	-5,82E-8
Acidification potential	mol H <sup>+</sup> e	1,01E-2	6,92E-4	1,19E-4	1,09E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,44E-5	1,79E-4	2,64E-4	5,6E-6	-8,88E-3
EP-freshwater <sup>2)</sup>	kg Pe	1,07E-4	9,63E-7	1,1E-6	1,09E-4	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,1E-8	2,33E-7	1,12E-6	1,41E-8	-1,08E-4
EP-marine	kg Ne	2,01E-3	2,46E-4	4,14E-5	2,3E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,52E-5	6,44E-5	5,58E-5	1,36E-5	-1,72E-3
EP-terrestrial	mol Ne	2,32E-2	2,71E-3	4,1E-4	2,64E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,67E-4	7,09E-4	6,45E-4	1,96E-5	-1,96E-2
POCP (“smog”) <sup>3)</sup>	kg NMVOCe	1,08E-2	7,59E-4	1,25E-4	1,17E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,59E-5	2,03E-4	1,77E-4	8,03E-6	-9,34E-3
ADP-minerals & metals <sup>4)</sup>	kg Sbe	3,3E-5	4,31E-7	1,42E-7	3,35E-5	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,68E-9	1,08E-7	2,8E-6	1,81E-9	-3,25E-5
ADP-fossil resources	MJ	2,51E1	1,86E0	2,89E-1	2,72E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,45E-2	4,78E-1	2,82E-1	1,44E-2	-1,48E1
Water use <sup>5)</sup>	m <sup>3</sup> e depr.	9,6E-1	9,05E-3	1,41E-2	9,83E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,2E-4	2,3E-3	5,47E-3	7,56E-5	-8,45E-1

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 PO<sub>4</sub>e; 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	1,77E-7	1,03E-8	1,97E-9	1,89E-7	MND	MND	MND	MND	MND	MND	MND	MND	MND	9,22E-10	3,5E-9	3,45E-9	1,01E-10	-1,39E-7
Ionizing radiation <sup>6)</sup>	kBq U235e	1,05E-1	9,99E-3	2,04E-3	1,17E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,05E-4	2,51E-3	3,15E-3	7,13E-5	3,53E-3
Ecotoxicity (freshwater)	CTUe	7,35E1	1,54E0	3,19E-1	7,54E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,68E-2	4,03E-1	1,28E0	5,28E-2	-1,03E2
Human toxicity, cancer	CTUh	1,44E-8	5,07E-11	4,6E-11	1,45E-8	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,03E-12	1,53E-11	3,91E-11	3,88E-13	-9,76E-9
Human tox. non-cancer	CTUh	5,62E-8	1,5E-9	2,81E-10	5,8E-8	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,94E-11	4,48E-10	1,75E-9	2,13E-11	2,16E-7
SQP <sup>7)</sup>	-	7,79E0	1,32E0	3,61E0	1,27E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,79E-3	4,16E-1	5,67E-1	3,12E-2	-4,43E0

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 <sup>8)</sup>	MJ	2,4E0	2,9E-2	3,04E-1	2,73E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	2,54E-4	6,98E-3	5E-2	2,7E-4	-1,48E0
Renew. PER as material	MJ	0E0	0E0	3,52E-1	3,52E-1	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	-3,52E-1	0E0
Total use of renew. PER	MJ	2,4E0	2,9E-2	6,56E-1	3,08E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	2,54E-4	6,98E-3	5E-2	-3,52E-1	-1,48E0
Non-re. PER as energy	MJ	2,51E1	1,86E0	2,42E-1	2,72E1	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	4,45E-2	4,78E-1	2,82E-1	1,44E-2	-1,48E1
Non-re. PER as material	MJ	0E0	0E0	4,66E-2	4,66E-2	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	-4,66E-2	0E0
Total use of non-re. PER	MJ	2,51E1	1,86E0	2,89E-1	2,72E1	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	4,45E-2	4,78E-1	2,82E-1	-3,23E-2	-1,48E1
Secondary materials	kg	2,16E-1	6,97E-4	1,11E-3	2,18E-1	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	1,74E-5	1,6E-4	3,14E-4	3,98E-6	7,22E-1
Renew. secondary fuels	MJ	2,59E-4	6,51E-6	9,58E-3	9,84E-3	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	5,7E-8	1,67E-6	1,63E-5	1,2E-7	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 <sup>3</sup>	2,16E-2	2,48E-4	3,39E-4	2,21E-2	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	2,7E-6	6,37E-5	1,65E-4	1,52E-5	-1,25E-2

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	1,01E0	2,29E-3	1,18E-3	1,01E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,96E-5	5,53E-4	1,92E-3	7,97E-6	-7E-1
Non-hazardous waste	kg	4,42E0	4,07E-2	2,82E-2	4,49E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,19E-4	9,8E-3	6,12E-2	7,15E-2	-5,89E0
Radioactive waste	kg	4,72E-5	1,28E-5	1,12E-6	6,11E-5	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,13E-7	3,28E-6	1,65E-6	9,61E-9	-2,75E-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	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	9,5E-1	0E0	0E0
Materials for energy rec	kg	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	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 <sub>2</sub> e	2,33E0	1,26E-1	1,64E-2	2,47E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,27E-3	3,13E-2	2,05E-2	7,33E-3	-1,72E0
Ozone depletion Pot.	kg CFC <sub>11</sub> e	1,12E-7	2,28E-8	2,03E-9	1,37E-7	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,6E-10	5,88E-9	2,08E-9	1,53E-10	-5,07E-8
Acidification	kg SO <sub>2</sub> e	8,2E-3	5,19E-4	9,05E-5	8,81E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,45E-5	1,34E-4	2,13E-4	4,29E-6	-7,31E-3
Eutrophication	kg PO <sub>4</sub> <sup>3</sup> e	4,43E-3	1,23E-4	6,89E-5	4,62E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,69E-6	3,15E-5	7,05E-5	1,08E-4	-4,99E-3
POCP ("smog")	kg C <sub>2</sub> H <sub>4</sub> e	1,11E-3	1,64E-5	6,68E-6	1,13E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,36E-7	4,37E-6	8,07E-6	1,62E-6	-1,18E-3
ADP-elements	kg Sbe	3,28E-5	4,19E-7	1,36E-7	3,33E-5	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,65E-9	1,05E-7	2,8E-6	1,77E-9	-3,25E-5
ADP-fossil	MJ	2,51E1	1,86E0	2,89E-1	2,72E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,45E-2	4,78E-1	2,82E-1	1,44E-2	-1,48E1

## 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  
15.09.2023

