ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804 for:

[Steel fiber]

From

[Yutian Zhitai Steel Fiber Manufacturing Co. Ltd]









Declared product:

Programme operator:	EPD China, www.epdchina.cn
Registration number:	EPD-CN-00003
Issued date:	2024-04-16
Revision date:	2024-11-20
Valid until:	2029-04-15



Programme Information

EPD Owner Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd							
	Contact: daixue@ztgxw.cn						
Product Name	Steel Fibre						
Production Site	Yutian Zhitai Steel Fiber Manufacturing Co.Ltd. Hejiazhuang Village, Yahongqiao Town, Yutian County, Tangshan City, Hebei Prov., China. Zip Code: 064102						
Identification of product	Group I: cold-drawn wire according to EN 14889-1:2016						
Field of Application	Improve the tensile strength, compressive strength, shear strength and increase the impact resistance of concrete to improve fatigue strength and other important performance indicators.						
Programme Operator	EPD China Address: 3rd floor, Lane 320, Tianping Road, Xuhui District, Shanghai Website: www.epdchina.cn Email: info@epdchina.cn secretary@epdchina.cn						
LCA Practitioner	Yufei Jiang Ecovane Environmental Co.,ltd						
Responsibility The EPD owner has the sole ownership, liability, and responsibility for the							
Comparability EPDs within same category of product in different programme operator suggested to be compared. Full conformance with a PCR allows EPD only when all stages of a life cycle have been considered. However, va deviations are possible even applying the same PCR							
Validity	The EPD is updated on 2024-10-31 and valid to2029-04-15						
LCA Software (version)	Simapro, Version 9.6						
LCI Dataset (version)	Ecoinvent Database, Version 3.10						
Year(s) of Primary Data	01/2022-12/2022						
PCR EPDEN-PCR-202204: PCR for construction Products and construction service 15804							
Other Reference Document /							
Verification statement according EN15804:2012+A2:2019							
Independent verification of the declaration and data according to EN ISO 14025:2010 □internal ⊠external Third-party institution verification: < Lillian Li, SGS-CSTC Standards Technical Services Co., Ltd.> is an approved certification body accountable for third-party verification Approved by: EPD China							
Procedure for follow-up of data during EPD validity involves a third-party certification body: \square Yes \square No							





EPD China EPD -CN -00003

1 General Information

1.1 Company information

Owner of the EPD: Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd Contact: daixue@ztgxw.cn Description of the organisation: Yutian Zhitai Steel Fiber Manufacturing Co.Ltd.was founded in 1996, and was formally established in 2011 through

continuous development in Tangshan Yutian, China.

The company have excellent management and scientific research personnel, advanced leadership team, advanced steel fibre production equipment caused by Zhitai brand steel fibre in strict accordance with the ISO 13270:2013 "steel fibre concrete" standard implementation of products by the national authoritative inspection agency (National building materials testing centre) tests all qualified. And has passed the China Quality Certification Centre of the ISO9001 quality management system certification.

The company are mainly divided into three series: glued steel fibre, RPC copper-plated steel fibre, hooked end steel fibre and has an annual output of 24913 tons of production capacity. The raw steel wire materials are mainly used from Tangshan Steel company.

Product-related or management system-related certifications:

Certificate of quality management system conforms to the Standard GB/T19001-2016/ISO9001:2015. Certificate of constancy of performance applies to the construction product: Steel fibres Group I conforms to EN 14889-1:2006.

Name and location of production site(s): Yutian Zhitai Steel Fiber Manufacturing Co.Ltd. Hejiazhuang Village, Yahongqiao Town, Yutian County, Tangshan City, Hebei Prov., China. Zip Code: 064102





1.2 Scope and type of EPD

Declared unit: Production of 1 ton steel fibres (mass excluding packaging)

Reference service life: n/a

Time representativeness: 2022 as reference year

Description of system boundaries:

Cradle-to-gate (A1-A3) with options: A4(Transport to customers), A5 (Installation), C1 (De-construction), C2 (Transport to End of life), C3 (Waste processing), C4 (Disposal) and D (Reuse-Recycling-recovery-potential).

Excluded life cycle stages:

All phases of the use stage B (as there are no emissions during the use of the product).

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Raw material supply	Transport	Production	Transport from the gate to the	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ 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
х	Х	Х	х	Х	ND	ND	ND	ND	ND	ND	ND	х	x	x	Х	х

Table: Process stages and and EPD modules.

Further information:

All inputs and outputs of the production by Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd were considered in the calculation. Generic data was used for the considered raw materials from the supplier due to the fact that these materials are not produced by Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd.

Supplier-specific distances of raw materials to the manufacturing site (A2) were provided by Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd via lorry > 32 metric ton, EURO5. For A5 and C2, distance of 20 km to waste treatment plant by lorry (EURO5, more than 32 metric ton) were assumed.

According to the information from Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd, after the use of steel fibres, 100% is assumed to be landfilled. The low impact from deconstruction in C1 and shredding in C3 is neglected.

Needed machines, plants and further infrastructure for the production at Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd are not considered in the calculation.

No allocations are applied in the product stage because there is no co-products.



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2 Detailed Product Description

2.1. Description of the product

Product name: Steel Fibre

Product identification: Group I: cold-drawn wire according to EN 14889-1:2016

Steel Fibers covered by this EPD:

Type of fibre	Length [mm]	Diameter [mm]	Aspect ratio (l/d)	Tensile	Strength
				[N/mm ³]	
Cold-drawn wire steel	13-60	0.2-1.0	45-100	1100-2850	
fibre					



Figure: Picture of the declared product.

<u>Product description:</u> Zhitai steel fibre is cold-drawn from steel wire with hooks on both ends, enhancing the grip with concrete. The glue of the steel fibre can guarantee rapid and convenient adding and mixing, as well as uniform distribution. The steel fibre can greatly improve the tensile strength, compressive strength, shear strength and increase the impact resistance of concrete to improve fatigue strength and other important performance indicators.

Zhitai steel fibres with hooked ends for concrete reinforcement covered by this EPD are manufactured in their own manufacturing plant in Tangshan, China. Steel fibres are produced in different diameters and lengths, depending on the application field and customer requirements. The fibres are usually packed either in big bags or paper sack of different dimensions. Zhitai steel fibre has been widely used all over world for different applications like high-speed railway, tunnel, building floor, highway pavement, airport runway, concrete sleeper etc.



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2.2 Description of production process



Figure: The production process in selected stages.

The steel fiber product process mainly includes seven steps. The raw material is mechanically deoxidized under normal temperature. After 7 dry drawing and 30 wet drawing procedures, it becomes a semi-finished product with a specific diameter. Then, it is doubled, glued, dried and cut to final packaging product. The electricity used in the manufacturing process is sourced from "Electricity, low voltage {CN-NCGC}| market for electricity, low voltage | Cut-off, U" from the Ecoinvent database.

2.3 Product components

Product components	Weight, ton	Weight-% (versus the product)				
Hot low carbon steel wire rods	1.0016	100.16%				
Auxiliary materials	Weight, ton	Weight-% (versus the product)				
Glue	0.0019	0.19%				
Packaging materials	Weight, ton	Weight-% (versus the product)				
Polypropylene (big bag)	0.0072	0.72%				
Kraft paper	0.0019	0.19%				
Paper sack	0.0015	0.15%				
Packaging film	0.0004	0.04%				
Pallet	0.0078	0.78%				
TOTAL	0.0189	1.89%				

Table: Main product components and packaging materials per unit.

Included products do not contain the substances included in the "Candidate List of SVHC" document issued by the European Chemicals Agency (http://echa.europa.eu/candidate-list-table).

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3 LCA results according to EN 15804

3.1 Environmental Impacts

The results of the underlying LCA are provided in this section as environmental impacts, resource use, output flows and additional information on biogenic carbon. All pre-set parameters of EN 15804 are required.

Core indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential total (GWP- total)	[kg CO2 eq.]	2.11E+03	1.14E+03	5.48E+00	0.00E+00	2.16E-03	0.00E+00	9.39E-04	-1.48E+00
Global Warming Potential fossil fuels (GWP-fossil)	[kg CO2 eq.]	2.12E+03	1.14E+03	4.67E+00	0.00E+00	2.16E-03	0.00E+00	9.38E-04	-1.48E+00
Global Warming Potential biogenic (GWP-biogenic)	[kg CO2 eq.]	-1.42E+01	1.53E-01	1.76E+01	0.00E+00	3.47E-07	0.00E+00	2.30E-07	-5.52E-04
Global Warming Potential land use and land use change (GWP-luluc)	[kg CO2 eq.]	8.07E+00	5.95E-01	-4.20E-04	0.00E+00	8.63E-07	0.00E+00	4.83E-07	5.17E-03
Depletion potential of the stratospheric ozone layer (ODP)	[kg CFC 11 eq.]	1.31E-05	1.63E-05	-4.04E-09	0.00E+00	3.18E-11	0.00E+00	2.71E-11	-5.77E-09
Acidification potential, Accumulated Exceedance (AP)	[mol H+ eq.]	9.23E+00	3.31E+01	-1.04E-04	0.00E+00	7.36E-06	0.00E+00	6.65E-06	-6.48E-03
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	[kg P eq.]	8.50E-01	3.68E-02	-4.15E-05	0.00E+00	1.69E-07	0.00E+00	7.79E-08	-5.69E-04
Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine)	[kg N eq.]	2.20E+00	8.23E+00	8.17E-03	0.00E+00	2.42E-06	0.00E+00	2.53E-06	-1.45E-03
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	[mol N eq.]	1.99E+01	9.14E+01	1.40E-03	0.00E+00	2.63E-05	0.00E+00	2.77E-05	-1.53E-02
Formation potential of tropospheric ozone (POCP)	[kg NMVOC eq.]	6.72E+00	2.48E+01	1.49E-05	0.00E+00	1.08E-05	0.00E+00	9.91E-06	-5.12E-03
Abiotic depletion potential for non- fossil resources (ADP- minerals&metals)	[kg Sb eq.]	8.75E-03	1.13E-03	-1.49E-06	0.00E+00	5.87E-09	0.00E+00	1.47E-09	-9.58E-06
Abiotic depletion potential for fossil resources (ADP-fossil)	MJ, net calorific value	1.36E+04	6.45E+02	-8.50E-01	0.00E+00	2.98E-03	0.00E+00	1.42E-03	-1.15E+01
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	[m3 world eq. Deprived]	1.25E+03	3.28E+01	-5.80E-01	0.00E+00	1.60E-04	0.00E+00	1.01E-03	2.14E-01

Table: Environmental impacts according to EN 15804.

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there

is limited experience with the indicator.

For all environmental impact indicators, the estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risk



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3.2 Resource use and waste categories

Core indicator	Unit	A1-A3	A4	A5	C1	C2	С3	C4	D
Use of renewable primary energy excluding renewable		1.84E+03	1.01E+02	7.37E+01	0.00E+00	3.98E-04	0.00E+00	2.07E-04	-1.27E+00
primary energy resources used as raw materials	MJ								
(PERE)									
Use of renewable primary energy resources used as	MI	7.39E+01	0.00E+00	-7.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
raw materials (PERM)	1115								
Total use of renewable primary energy resources		1.92E+03	1.01E+02	-1.85E-01	0.00E+00	3.98E-04	0.00E+00	2.07E-04	-1.27E+00
(PERT) (primary energy and primary energy resources	MJ								
used as raw materials)									
Use of non-renewable primary energy excluding non-		2.16E+04	1.40E+04	7.86E+01	0.00E+00	3.13E-02	0.00E+00	2.30E-02	-1.58E+01
renewable primary energy resources used as raw	MJ								
materials (PENRE)									
Use of non-renewable primary energy resources used	MJ	8.33E+01	0.00E+00	-8.33E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
as raw materials (PENRM)									
Total use of non-renewable primary energy resources	NG	2.17E+04	1.40E+04	-4.64E+00	0.00E+00	3.13E-02	0.00E+00	2.30E-02	-1.58E+01
(PENRI) (primary energy and primary energy	MJ								
resources used as raw materials)		2 20E 102	0.00E+00	0.0000	0.005+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of secondary material (SM)	kg	2.20E+02	0.001+00	0.001.+00	0.001.+00	0.001+00	0.001.+00	0.001.+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	-7.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF)	MJ	0.00E+00	1.01E+02	6.76E-02	0.00E+00	3.98E-04	0.00E+00	1.38E-03	-5.25E+01
Net use of fresh water (FW)	m3	1.97E+01	1.04E+00	-1.18E-02	0.00E+00	4.66E-06	0.00E+00	2.39E-05	4.31E-04
Hazardous waste disposed (HWD)	kg	7.11E-03	3.84E-03	1.22E-04	0.00E+00	1.21E-08	0.00E+00	7.53E-09	-6.10E-06
Non-hazardous waste disposed (NHWD)	kg	1.94E-01	2.95E-02	2.86E-03	0.00E+00	1.97E-06	0.00E+00	1.11E-04	-1.13E-04
Radioactive waste disposed (RWD)	kg	1.23E-01	9.82E-03	-1.54E-05	0.00E+00	4.23E-08	0.00E+00	2.24E-08	-6.39E-05
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (MR)	kg	0.00E+00	0.00E+00	4.55E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.50E-01
Materials for energy recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity (EEE)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal (EET)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table: Resource use and waste categories according to EN 15804.

3.3 Information on biogenic carbon content

Biogenic carbon content	Unit (expressed per functional unit or per declared unit)
Biogenic carbon content in product	0 ton C/ton
Biogenic carbon content in accompanying packaging	0.0118 ton C/ton
NOTE: 1 kg biogenic carbon is equivalent to 44/12 kg of CO2.	





4 Supplementary information

4.1 Calculation rules

All inputs and outputs of the production by Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd were considered in the calculation. Generic data was used for the considered raw materials from the supplier due to the fact that these materials are not produced by Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd.

Supplier-specific distances of raw materials to the manufacturing site (A2) were provided by Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd via lorry > 32 metric ton, EURO5. For A5 and C2, distance of 20 km to waste treatment plant by lorry (EURO5, more than 32 metric ton) were assumed.

With regards to Module A5, this LCA analysis is assumed that the consumption of additional material and energy for installation is zero. Besides, according to the information provided by Zhitai, the product packaging is assumed to become to waste in this stage and is treated to end-of-life stage.

The modelling of the module C1 is based on the module A5, whereby it is assumed that the consumption of additional materials and energy used in the deconstruction stage is zero.

For module C2, the assumption has been made that the waste product would be transported for 50 km by truck. For the waste processing module C3, no energy and material are needed.

For module C4, the 15% of the rest of the waste product would be sent to C4 for disposal, and 85% to recycling according to the worldsteel data (Worldsteel 2018).

Needed machines, plants and further infrastructure for the production at Yutian Zhitai Steel Fiber Manufacturing Co.,Ltd are not considered in the calculation.

All known and available primary data of the production processes were considered. Therefore, no cut off rules were applied.





This EPD is the updated version 1.0. Differences from the previous are stated in the following:

1. The company's reported electricity use has been adjusted to exclude power from other product manufacturing line, reduced from 355 kWh/ton product to 180 kWh/ton.

2. The amount of the raw material use "Steel wire rod" is updated, reduced from 1.3314 ton/ton product to 1.0016 ton/ton product.

3. Database update from Ecoinvent 3.9.1 to Ecoinvent 3.10.

4. Use "Steel, low-alloyed {RoW}| steel production, electric, low-alloyed | Cut-off, U" and "wire drawing" instead of raw material "steel wire rod" modelling.

5. Change the dataset use "Electricity, medium voltage {CN-NCGC}| market for electricity, medium voltage | Cut-off, U" to "Electricity, low voltage {CN-NCGC}| market for electricity, low voltage | Cut-off, U".

6. The function unit is changed from "production of 1 kg steel fibres (mass excluding packaging)" to "production of 1 ton steel fibres (mass excluding packaging)".

7. For module C4, the 15% of the rest of the waste product would be sent to C4 for disposal, and 85% to recycling according to the worldsteel data (Worldsteel 2018).





References

- General Programme Instructions of EPD China. Version 1.0.
- EPDEN-PCR-202204: PCR for construction Products and construction services to EN 15804
- ISO 14025:2006, Environmental labels and declarations Type III environmental declarations Principles and procedures.
- ISO 14040:2006/Amd 1:2020Environmental management Life cycle assessment Principles and framework — Amendment 1
- ISO 14044:2006/Amd 2:2020Environmental management Life cycle assessment Requirements and guidelines — Amendment 2
- EN 15804:2012+A2:2019, Sustainability of construction works Environmental product declarations —
 Core rules for the product category of construction products
- Product Environmental Footprint Category Rules (PEFCRs) Annex II Part C
- Ecoinvent, 2023. Swiss Centre for Life Cycle Assessment, version 3.9.1 (www.ecoinvent.ch).
- PRé Consultants, 2021. Software SimaPro version 9.5.0.0 (www.pre.nl).
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- Worldsteel (2018). Steel the surprising recycling champion. https://worldsteel.org/mediacentre/blog/2018/steel-surprising-recycling-champ

