ENVIRONMENTAL PRODUCT DECLARATION

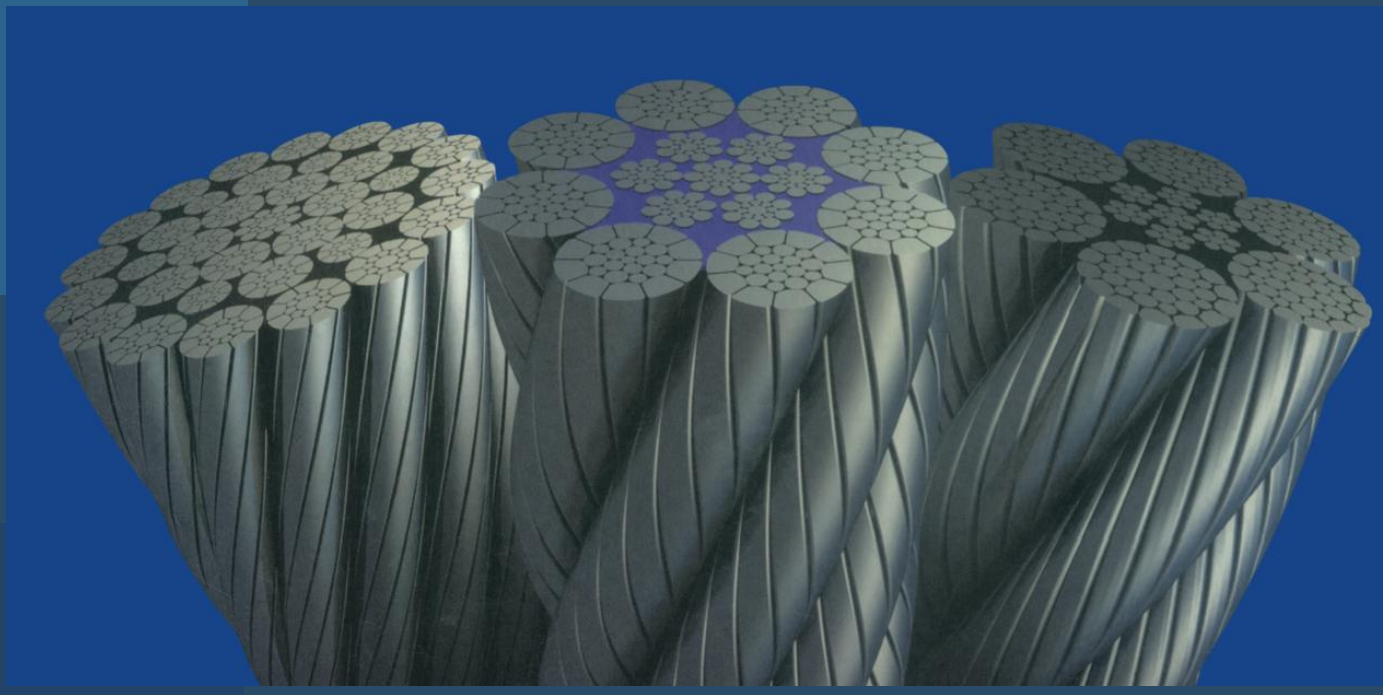
In accordance with ISO 14025 and EN 15804 for:

Steel wire ropes

From

Nantong Development Zone Weifu Foreign Trade Co., Ltd

Declared product:



Programme operator:	EPD China
Registration number:	EPD-CN-00049
Issued date:	2025-12-26
Valid until:	2030-12-25

Programme Information

EPD Owner	Development Zone Weifu Foreign Trade Co., Ltd Contact: ken7777cs@gmail.com Address: 7th Floor, Yinxing Building, No.228 Gongnong Road,Nantong City, China
Product Name	Ungalvanized Steel Wire Ropes and Galvanized Steel Wire Ropes
Production Site	No. 99 Tongda Road, Chongchuan District, Nantong City, Jiangsu Province, China
Identification of product	UNCPC code: 4292 Metal fasteners, springs and miscellaneous articles made from metal wire
Field of Application	Construction and infrastructure applications, such as hoisting, mining, offshore, etc.
Programme Operator	EPD China Address of Headquarter: Tianping Road, Xuhui District, Shanghai Website: www.epdchina.cn Email: info@epdchina.cn | secretary@epdchina.cn
LCA Practitioner	Chao WANG, Ecovane Environmental, support@1mi1.cn
Responsibility	The EPD owner has the sole ownership, liability, and responsibility for the EPD
Comparability	EPDs within same category of product in different programme operator are not suggested to be compared. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible even applying the same PCR.
Liability	The EPD owner has the sole ownership, liability, and responsibility for the EPD.
Validity	The EPD is published on 2025-12-26 and valid to2030-12-25
LCA Software (version)	Simapro 10.2
LCI Dataset (version)	Ecoinvent 3.11
Year(s) of Primary Data	01/2024-12/2024
PCR	EPD China PCR: Construction products and construction services V 2.1.
Other Reference Document	EN 15804:2012+A2:2019 Environmental product declaration - Core rules for the product category of construction products.
Verification statement according EN15804	
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐ internal ☑ external Third-party institution verification: <Weifang Yao,WIT > 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: ☐ Yes ☑ No	

1 General Information

1.1 Company information

Established in 1991, Nantong Development Zone Weifu Foreign Trade Co., Ltd is a professional foreign trade company which is merged and restructured of five state-owned foreign trade companies in the original development zone. The company mainly engages in import and export business of clothing, shoes and hats, bedding, hardware and electromechanical products, and other commodities. The steel wire ropes products are produced by Tongjiang New Material that entrusted by Weifu, then export in China and Southeast Asia.

1.2 Scope and type of EPD

System boundary: Cradle-to-gate, A4-A5, C1-C4 and D

Table 1 Process stages and EPD modules.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITSAND LOADSBEYOND THESYSTEM BOUNDARIES
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**
x	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x

Note: X=Declared Module, MND=Module not Declared in this LCA study

1.3 Declared unit

In this study the declared unit is defined as one metric ton of steel wire ropes products. And the defined mass of the product per declared unit is described in Table below.

Table 2 Declared unit details

Name	Value	Unit
Declared unit	1	Metric ton

2 Detailed Product Description

2.1 Description of the product

Steel wire ropes consist of several hot-rolled steel wires, including a central core wire surrounded by helically wound wires, ensuring enhanced structural integrity and load-bearing capacity. The product is available in various diameters, surface finishes (e.g. ungalvanized, galvanized), and mechanical properties to meet the requirements of different construction and infrastructure applications, such as hoisting, mining, offshore, etc.

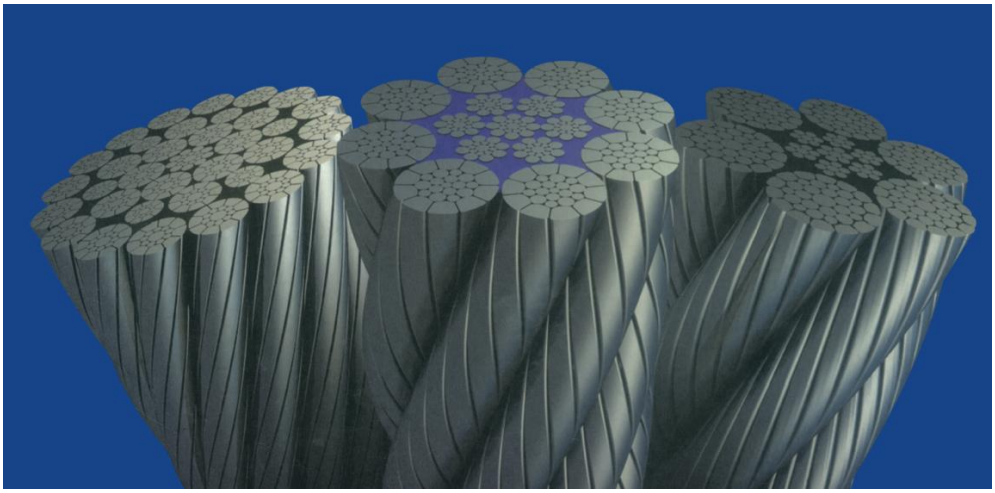


Figure 1 Picture of the declared product

2.2 Description of the production process

The manufacturing process of steel wire ropes products mainly includes coating, pickling, drawing, stranding, closing and packaging, which involves raw materials, packaging materials, energy and emissions. The figure below shows the production process of products.

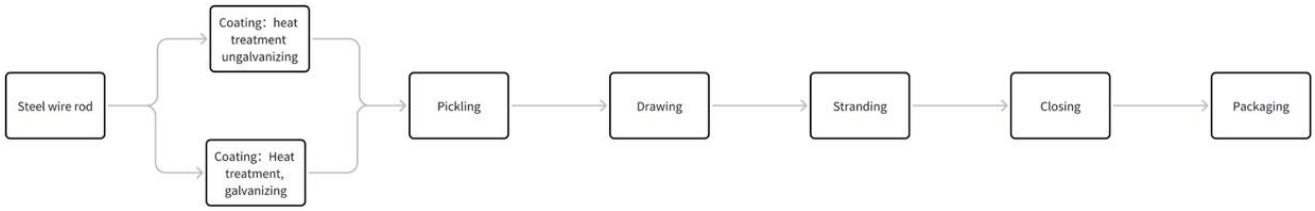


Figure 2 The production process in selected stages.

A detailed steel wire ropes products information is depicted below.

Table 3 Specification of steel wire ropes products

Technical feature	Value
Central core wire	Steel, hemp
Steel wire rope grade	1770, 1960, 2160
Steel wire surface finishes	Ungalvanized, galvanized
Twisted type	Interactive twist, lang lay
Twist direction	Left, right
Strand number	4, 6, 8, 18, 24, 35

Table 4 Content information of steel wire ropes products

Element	Fe	C	Si	Mn	P	S
Weight (%)	>98	≤0.85	≤0.30	≤0.60	≤0.02	≤0.01
CAS number	7439-89-6	7440-44-0	7440-21-3	7439-96-5	12185-10-3	7440-50-8

Table 5 Technical data of steel wire ropes products (6*19 series)

Diameter (mm)	Weight (kg/m)		Minimum breaking load (kN)					
	Hemp core	Steel core	Grade 1770		Grade 1960		Grade 2160	
			Hemp	Steel	Hemp	Steel	Hemp	Steel
10	0.388	0.426	58.4	63	64.7	69.8	71.3	76.9
11	0.469	0.515	70.7	76.2	78.3	84.4	86.2	93
12	0.559	0.613	84.1	90.7	93.1	100	103	111
13	0.656	0.72	98.7	106	109	118	120	130
14	0.76	0.835	114	124	127	137	140	151
16	0.993	1.091	150	161	166	179	182	197
18	1.257	1.38	189	204	210	226	231	249
19	1.401	1.538	211	227	233	252	257	278
20	1.552	1.704	234	252	259	279	285	308
22	1.878	2.062	283	305	313	338	345	372
24	2.235	2.454	336	363	373	402	411	443
26	2.623	2.88	395	426	437	472	482	520
28	3.042	3.34	458	494	507	547	559	603
30	3.492	3.762	525	567	582	628	641	692
32	3.973	4.362	598	645	662	715	730	787
34	4.393	4.832	675	728	748	807	824	889
36	5.028	5.521	757	817	838	904	924	997
40	6.208	6.816	935	1008	1035	1116	1140	1230
44	7.512	8.247	1131	1220	1252	1351	1380	1489
48	8.94	9.815	1346	1452	1490	1608	1642	1772
52	10.492	11.519	1579	1704	1749	1887	1927	2079
56	12.168	13.359	1832	1976	2028	2188	2235	2411
60	13.968	15.336	2103	2268	2328	2512	2566	2768

The type and ratio/weight of raw materials per declared unit are listed in table below.

Table 6 Main product components and packaging materials per declared unit

Raw material	Unit	Ungalvanized steel wire ropes	Galvanized steel wire ropes
Steel wire rod	t	1.02	/
Galvanized steel wire rod		/	1.02
Hemp	kg	0.891	/
Packaging			
Steel pallet	t	0.0278	
Wood pallet	t	0.0223	
Packaging film	t	0.0002	
Paperboard	t	0.000145	

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.

Table 7 Environmental impacts for ungalvanized steel wire ropes

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit									
Impact category	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO2 eq.	2.91E+03	7.12E+01	3.88E+01	0.00E+00	1.00E+01	2.64E+00	1.30E-01	-1.01E+03
GWP-fossil	kg CO2 eq.	2.94E+03	7.12E+01	1.97E-05	0.00E+00	1.00E+01	2.61E+00	1.30E-01	-1.97E+03
GWP-biogenic	kg CO2 eq.	-3.71E+01	1.24E-02	3.88E+01	0.00E+00	2.29E-03	1.68E-02	3.65E-05	9.57E+02
GWP-luluc	kg CO2 eq.	1.78E+00	3.66E-02	3.25E-09	0.00E+00	4.54E-03	1.28E-02	3.40E-05	7.38E+00
ODP	kg CFC 11 eq.	1.56E-05	9.95E-07	9.55E-14	0.00E+00	1.36E-07	7.28E-08	7.11E-09	7.17E-05
AP	mol H+ eq.	1.27E+01	1.59E+00	4.39E-08	0.00E+00	4.23E-02	1.23E-02	5.64E-04	-7.46E+00
EP-freshwater	kg P eq.	1.54E+00	3.99E-03	5.63E-10	0.00E+00	1.09E-03	9.56E-04	6.93E-06	-4.07E+00
EP-marine	kg N eq.	2.72E+00	4.04E-01	4.83E-07	0.00E+00	1.51E-02	1.83E-03	8.06E-05	-1.76E+00
EP-terrestrial	mol N eq.	2.92E+01	4.49E+00	1.23E-07	0.00E+00	1.65E-01	1.80E-02	8.62E-04	-2.76E+01
POCP	kg NMVOC eq.	1.05E+01	1.24E+00	1.11E-07	0.00E+00	5.74E-02	1.00E-02	1.07E-03	-1.32E+01
ADPE	kg Sb eq.	2.21E-02	1.17E-04	7.55E-12	0.00E+00	3.31E-05	2.00E-06	9.21E-08	-4.93E-02
ADPF	MJ, net calorific value	3.24E+04	9.05E+02	8.68E-05	0.00E+00	1.39E+02	6.40E+01	7.48E+00	1.99E+03
WDP	m3 world eq. deprived	9.38E+02	2.71E+00	5.25E-05	0.00E+00	6.45E-01	2.64E-01	7.93E-03	-4.07E+03
PM	Disease incidence	2.75E-04	3.11E-06	6.33E-13	0.00E+00	7.98E-07	5.64E-08	5.58E-09	-5.09E-04
IRP	kBq U235 eq.	1.01E+02	4.95E-01	1.18E-07	0.00E+00	1.12E-01	1.20E-02	1.57E-03	3.44E+02
ETP-fw	CTUe	1.74E+04	9.51E+01	6.37E-03	0.00E+00	2.55E+01	5.66E+00	3.14E-01	-2.51E+04
HTP-c	CTUh	3.00E-06	1.42E-08	3.60E-15	0.00E+00	1.68E-09	2.55E-10	2.10E-11	-1.42E-05
HTP-nc	CTUh	2.50E-05	3.23E-07	7.79E-13	0.00E+00	8.63E-08	1.22E-08	6.36E-10	-1.59E-04
SQP	dimensionless	9.50E+03	2.09E+02	1.91E-04	0.00E+00	8.20E+01	5.18E+00	4.80E-01	2.23E+04

Table 8 Environmental impacts for galvanized steel wire ropes

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per declared unit									
Impact category	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO2 eq.	3.15E+03	7.12E+01	3.88E+01	0.00E+00	1.00E+01	2.64E+00	1.30E-01	-1.01E+03
GWP-fossil	kg CO2 eq.	3.18E+03	7.12E+01	1.97E-05	0.00E+00	1.00E+01	2.61E+00	1.30E-01	-1.97E+03
GWP-biogenic	kg CO2 eq.	-3.62E+01	1.24E-02	3.88E+01	0.00E+00	2.29E-03	1.68E-02	3.65E-05	9.57E+02
GWP-luluc	kg CO2 eq.	2.43E+00	3.66E-02	3.25E-09	0.00E+00	4.54E-03	1.28E-02	3.40E-05	7.38E+00
ODP	kg CFC 11 eq.	2.04E-05	9.95E-07	9.55E-14	0.00E+00	1.36E-07	7.28E-08	7.11E-09	7.17E-05
AP	mol H+ eq.	3.57E+01	1.59E+00	4.39E-08	0.00E+00	4.23E-02	1.23E-02	5.64E-04	-7.46E+00
EP-freshwater	kg P eq.	1.73E+00	3.99E-03	5.63E-10	0.00E+00	1.09E-03	9.56E-04	6.93E-06	-4.07E+00
EP-marine	kg N eq.	3.75E+00	4.04E-01	4.83E-07	0.00E+00	1.51E-02	1.83E-03	8.06E-05	-1.76E+00
EP-terrestrial	mol N eq.	1.29E+02	4.49E+00	1.23E-07	0.00E+00	1.65E-01	1.80E-02	8.62E-04	-2.76E+01
POCP	kg NMVOC eq.	1.18E+01	1.24E+00	1.11E-07	0.00E+00	5.74E-02	1.00E-02	1.07E-03	-1.32E+01
ADPE	kg Sb eq.	1.06E-01	1.17E-04	7.55E-12	0.00E+00	3.31E-05	2.00E-06	9.21E-08	-4.93E-02
ADPF	MJ, net calorific value	3.61E+04	9.05E+02	8.68E-05	0.00E+00	1.39E+02	6.40E+01	7.48E+00	1.99E+03
WDP	m3 world eq. deprived	1.12E+03	2.71E+00	5.25E-05	0.00E+00	6.45E-01	2.64E-01	7.93E-03	-4.07E+03
PM	Disease incidence	4.95E-04	3.11E-06	6.33E-13	0.00E+00	7.98E-07	5.64E-08	5.58E-09	-5.09E-04
IRP	kBq U235 eq.	1.36E+02	4.95E-01	1.18E-07	0.00E+00	1.12E-01	1.20E-02	1.57E-03	3.44E+02
ETP-fw	CTUe	4.27E+04	9.51E+01	6.37E-03	0.00E+00	2.55E+01	5.66E+00	3.14E-01	-2.51E+04
HTP-c	CTUh	3.77E-06	1.42E-08	3.60E-15	0.00E+00	1.68E-09	2.55E-10	2.10E-11	-1.42E-05
HTP-nc	CTUh	4.30E-05	3.23E-07	7.79E-13	0.00E+00	8.63E-08	1.22E-08	6.36E-10	-1.59E-04
SQP	dimensionless	1.06E+04	2.09E+02	1.91E-04	0.00E+00	8.20E+01	5.18E+00	4.80E-01	2.23E+04

3.2 Resource use and waste categories

Table 9 Resource use for ungalvanized steel wire ropes

RESULTS OF THE LCA - Resource use per declared unit									
Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PENRE	MJ	2.20E+04	6.28E+01	9.83E-06	0.00E+00	1.77E+01	1.33E+01	1.12E-01	-3.87E+03
PERE	MJ	3.53E+03	8.69E+00	1.77E-06	0.00E+00	1.94E+00	1.98E+00	2.07E-02	1.40E+02
PENRM	MJ	8.75E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ	3.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.20E+04	6.28E+01	9.83E-06	0.00E+00	1.77E+01	1.33E+01	1.12E-01	-3.87E+03
PERT	MJ	3.53E+03	8.69E+00	1.77E-06	0.00E+00	1.94E+00	1.98E+00	2.07E-02	1.40E+02
FW	m3	2.56E+01	8.37E-02	1.22E-06	0.00E+00	1.94E-02	1.73E-02	2.34E-04	-1.14E+01
SM	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
RSF	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
NRSF	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 10 Waste categories for ungalvanized steel wire ropes

RESULTS OF THE LCA - Waste categories per declared unit									
Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	2.47E-04	5.13E-06	5.96E-13	0.00E+00	9.44E-07	3.47E-07	5.30E-08	-3.92E-05
NHWD	kg	2.10E-01	1.34E-02	3.29E-07	0.00E+00	6.48E-03	7.88E-05	1.03E-04	-7.02E-02
RWD	kg	2.50E-05	1.21E-07	2.88E-14	0.00E+00	2.75E-08	2.73E-09	3.81E-10	7.88E-06
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
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.00E+02	0.00E+00
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
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
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 11 Resource use for galvanized steel wire ropes

RESULTS OF THE LCA - Resource use per declared unit									
Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PENRE	MJ	2.35E+04	6.28E+01	9.83E-06	0.00E+00	1.77E+01	1.33E+01	1.12E-01	-3.87E+03
PERE	MJ	3.94E+03	8.69E+00	1.77E-06	0.00E+00	1.94E+00	1.98E+00	2.07E-02	1.40E+02
PENRM	MJ	8.75E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ	3.62E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.35E+04	6.28E+01	9.83E-06	0.00E+00	1.77E+01	1.33E+01	1.12E-01	-3.87E+03
PERT	MJ	3.94E+03	8.69E+00	1.77E-06	0.00E+00	1.94E+00	1.98E+00	2.07E-02	1.40E+02
FW	m3	3.08E+01	8.37E-02	1.22E-06	0.00E+00	1.94E-02	1.73E-02	2.34E-04	-1.14E+01
SM	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
RSF	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
NRSF	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 12 Waste categories for galvanized steel wire ropes

RESULTS OF THE LCA - Waste categories per declared unit									
Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	7.13E-01	5.13E-03	5.96E-10	0.00E+00	9.44E-04	3.47E-04	5.30E-05	-3.92E-02
NHWD	kg	2.23E+02	1.34E+01	3.29E-04	0.00E+00	6.48E+00	7.88E-02	1.03E-01	-7.02E+01
RWD	kg	3.40E-02	1.21E-04	2.88E-11	0.00E+00	2.75E-05	2.73E-06	3.81E-07	7.88E-03
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
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.00E+02	0.00E+00
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
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
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

3.3 Information on biogenic carbon content

Information on biogenic carbon content which shall be included in the EPD as follows.

Table 13 Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit (expressed per functional unit or per declared unit)
Biogenic carbon content in product	0 kg C
Biogenic carbon content in accompanying packaging	10.59 kg C
NOTE：1 kg biogenic carbon is equivalent to 44/12 kg of CO2.	

4 Supplementary information

4.1 Calculation rules

Assumptions

The main assumptions of this LCA study are as follows:

- Transport assumptions are made where it is not possible to obtain the specific data. For instance, product transportation stage (A4) is assumed as 100km land and 5000km sea transportation, transport of waste product (C2) is assumed as 50km by lorry.
- It is assumed that no specialized deconstruction or demolition processes are required for the steel wire ropes products.
- During the end-of-life stage, the transportation of the waste steel wire ropes from the operation site to treatment facilities such as dismantling site and disposal facilities is assumed to be 50km for simplification and a sensitivity analysis is conducted.

Cut off rules

The following procedure was followed for the exclusion of inputs and outputs:

- All inputs and outputs to a (unit) process will be included in the calculation for which data is available. Data gaps may be filled by conservative assumptions with average or generic data. Any assumptions for such choices will be documented.
- In case of insufficient input data or data gaps for a unit process, according to the EN 15804 requirement, the cut-off criteria chosen is 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The total neglected input flows of the cradle to grave stage, e.g. per module A1-A3, A4-A5, C1-C4 and module D shall be a maximum of 5% of energy usage and mass.

Excluded processes

- Production and disposal of the infrastructure and capital equipment (buildings, machines, transport media, roads, etc.) and their maintenance during product assembly, installation and maintenance.
- Storage phases and sales of steel wire ropes products.
- Steel wire ropes products losses due to abnormal damage such as natural disasters or fire accidents. These losses would mostly be accidental.
- Handling operations at the distribution centre and retail outlet due to small contribution and negligible impact.
- Transport from distribution warehouse to retail outlet and from retail outlet to consumer household or commercial centre.
- Process of pickling because of outsourcing.

Data quality

The data quality requirements for this study were as follows:

- Existing LCI data were, at most, 10 years old. Newly collected LCI data were current or up to 3 years old.
- The LCI data related to the geographical locations in which the processes occurred, e.g. electricity data from China, transportation and disposal in SEA.
- The technology represented the average technologies at the time of data collection.

In the study the key parameters for producer-specific foreground data are based on 1 year of averaged data. In case of gap of data from Ecoinvent database, to avoid using dummy (empty) processes in the study, and also to use as much regional data as possible in some cases, alternative database is also referred to. For more of the data information, please refer to section 9 of transparency documentation.

This report covers steel wire ropes products in Nantong and provided data for the period January to December 2024. The products are produced by steel wire rod, and the site is powered by State Grid and PV. This report covers transport to, and end-of-life in SEA. Background data was sourced from the Ecoinvent 3.11 database.

Allocations

For process-related allocations, a distinction is made between multi-input and multi-output processes.

Multi-input processes

For data sets in this study, the allocation of the inputs from coupled processes is generally carried out via the mass. For literature data, the source is generally referred to. Specially in allocating the energy within the production site i.e. electricity, allocation is via both mass and size of the product produced on a yearly average. The principle for choosing the mass and size is based on the relationship of the input to the output (of product) to the environmental impacts.

Multi-output processes

In this study, there is no other by-products produced from the production line, hence there is quite little occasion that requires allocation for multi-output processes. One allocation occurs on the environmental emissions allocation, especially in the area of waste treatment. In the end-of-life stage, the allocation within the disposal scenario follows mass allocation, which applies to waste treatment process inventory adopted from Ecoinvent data.

For recycling and disposal process at the end-of-life stage, to be conservative, the benefit of recycling and recovery is not included in the product system and will not be allocated to steel wire ropes product.

4.2 Scenarios and additional technical information

Raw materials transportation

The transportation mainly takes place on the upstream of raw material supply and downstream of product delivery. All the raw materials are delivered within a radius of 100km distance, mainly from Jiangsu Province where the manufacturing site is located. The information related to transportation including distance and vehicle is shown in table below.

Table 14 Transportation of raw materials and packaging materials

Materials	Source	Distance/km	Vehicle
Steel wire rod	Zhangjiagang	50	Ship
Galvanized steel wire rod	Zhangjiagang	50	Ship
Hemp	Nantong	50	Lorry
Lubricating oil	Suzhou	100	Lorry
Steel pallet	Nantong	20	Lorry
Wood pallet	Nantong	10	Lorry
Packaging film	Nantong	8	Lorry
Carton	Nantong	8	Lorry

Manufacturing

The manufacturing process of steel wire ropes products mainly includes coating, pickling, drawing, stranding, closing and packaging, which involves raw materials, packaging materials, energy and emissions.

The life cycle inventory data of steel wire ropes products including input and output data of energy and other packaging materials. And all the life cycle inventory data of manufacturing is calculated and submitted by the factory. The type and ratio/weight of raw materials and packaging per product are listed in table below. The other input and output data show in the table below.

Table 15 Auxiliary material, Energy and Output waste of manufacturing

Material/Energy/Process	Unit	Ungalvanized steel wire ropes	Galvanized steel wire ropes
Auxiliary material			
Lubricating oil	t	0.0268	
Energy			
Electricity (ECGC)	kWh	340.4232	
Electricity (PV)	kWh	117.2850	
Water	t	0.2924	
Output			
Waste scrap	t	0.0101	
Waste oil	t	0.0000185	

In this study, the grid mix data on electricity of for the site in Nantong is based on grid mixes of the State Grid East China Branch (ECGC). Electricity mix has been modelled from Ecoinvent database 3.11. The electricity inventory is based on the year of 2022 for Chinese electricity generation (China Energy Statistics).

The GHG emission of ECGC is 0.764 kg CO2 eq/kWh. Plus, the PV is also used in manufacturing of steel wire ropes, and the GHG of PV is 0.076 kg CO2 eq/kWh.

Transportation of products

According to the factory, steel wire ropes products are consumed to SEA. Oceanic and road transportation distance for product delivery is estimated with reference from external resources.

Table 16 Transportation of products

Market location	Distance (km)	Vehicle
SEA	100	Lorry
	5000	Container via Ship

Installation

The installation of steel wire ropes products is a relatively simple task. There are no tools which is necessary for installation. However, the disposal of packaging materials is included in the installation stage. According to Weifu, the target market of steel wire ropes products is SEA. The disposal of packaging materials will adopt a rough country and region weighted average disposal mode following literature review. For packaging disposal in SEA, the waste disposal scenario from Malaysia is set default. Note that steel pallet and wood pallet can be reused.

According to EPD China PCR, specific packaging scenario assumptions should be declared based on packaging type by disposition pathways.

Table 17 Packaging disposal in the target market

Nation	Packaging type	Recycling	Landfill	Incineration
SEA	Metal	100%	0%	0%
	Wood	100%	0%	0%
	Plastic	5%	95%	0%
	Carton	5%	95%	0%

End-of-life

The disposal of the used steel wire ropes products will adopt a region average disposal mode following literature review. It is assumed that no specialized deconstruction or demolition processes (C1) are required for the steel wire ropes products. The steel, which is recovered from the dismantling of steel articles, is assumed to be transported by truck to a recycling yard or waste processing site (C2). A typical distance of 50 km is used. Default data is used in waste processing treatment stage (C3). A recycling rate of 90% has been assumed for the crude steel product. That is to be seen as the proportion of the material in the product that will be recycled in a subsequent system, and the remaining 10% is assumed to be sent to landfill (Steel Construction Institute, 2012). End of life disposal treatment process (C4) from Ecoinvent 3.11 database will be used in this LCA study.

Table 18 Scenario and additional technical information of end of life

Scenario	Parameter	Value	Unit
C1	Energy required for deconstruction, diesel	0	MJ
C2	Transport to waste processing site	50 (lorry)	km
C3	Loading and unloading at sorting facility	1.8 (diesel)	kWh
	Mechanical sorting	2.2 (electricity)	kWh
	Fragging of steel	7.4 (diesel)	kWh
C4	Compacting of inert construction waste for landfills (including backfilling)	1.6 (diesel)	kWh
	Waste for recycling	90	%
	Waste for final disposal - landfill	10	%

Benefits and loads beyond the system boundaries

It is assumed that 90% of the steel used in the structure is recovered for recycling, while the remainder is landfilled. “Benefits and loads beyond the system boundary” (module D) accounts for the environmental benefits and loads resulting from net steel scrap that is used as raw material in the converter and that is collected for recycling at end of life. These benefits and loads are calculated by including the burdens of recycling and the benefit of avoided primary production. Low-alloyed steel production using converter in China from Ecoinvent dataset will be used in this LCA study. The net scrap approach has been applied towards the metal recycling benefit in module D. Net scrap = Amount of steel recycled at EoL – Scrap input from previous product life cycles.

4.3 Dangerous substances

There are no dangerous substances into indoor air, oil and water during the use stage.

References

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3. EN 15804:2012+A2:2019 Environmental product declaration - Core rules for the product category of construction products.
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