ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804 for:

Prestressed concrete steel wire and strand

From

Tianjin Dejia PC Steel Strand Co., Ltd.

Declared product: Prestressed concrete steel wire
Prestressed concrete steel strand
Unbonded prestressed concrete steel strand

Programme operator:	EPD China
Registration number:	EPD-CN-00054
Issued date:	2026-04-10
Valid until:	2031-04-09

Programme Information

EPD Owner	Tianjin Dejia PC Steel Strand Co., Ltd. Contact: Li Qingyan, +86 15822870321, tjdejia001@163.com Address: No. 13, Fengze Third Avenue, Balitai Town, Jinnan District, Tianjin, China.
Product Name	Prestressed concrete steel wire and strand
Production Site	No. 13, Fengze Third Avenue, Balitai Town, Jinnan District, Tianjin, China.
Identification of product	UNCPC code: 41267 Wire of alloy steel
Field of Application	Reinforcing a wide range of structural components, from bridges and high-rise buildings to nuclear facilities, using both pre-tensioning and post-tensioning methods to enhance load capacity and durability.
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 2026-04-10 and valid to2031-04-09
LCA Software (version)	Simapro 10.3
LCI Dataset (version)	Ecoinvent 3.11
Year(s) of Primary Data	01/2025-12/2025
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: <Michael ZHU Jiang , DQS AP 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: ☐ Yes ☑ No	

1 General Information

1.1 Company information

Established in 2005, Tianjin Dejia PC Steel Strand Co., Ltd. is a professional enterprise specializing in the production of prestressed concrete steel wire strand and prestressed concrete steel wire. The company's main products include prestressed concrete steel strand, prestressed concrete steel wire, unbonded prestressed steel strand, and retard-bonded prestressed steel strand, with an annual production capacity exceeding 160,000 tons. Its products are widely marketed both domestically and overseas, and are extensively used in railways, highways, bridges, coal mines, cement pipes, poles, SP boards, ground anchorages, and other fields.

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 prestressed concrete steel wire and strand 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

Prestressed concrete steel wire is made of wire rod. Mainly used for producing prestressed concrete components of various structural shapes, including large, medium, and small, using the first to last tensioning method. Such as large-scale railway, highway bridges, roof trusses, crane beams, industrial and civil prefabricated panels, wall panels, pipe piles, electric poles and prestressed concrete water pipes, television towers, nuclear power plants and other engineering constructions.

Figure 1 Prestressed concrete steel strand

Table 3 Specification of prestressed concrete steel wire

Nominal diameter (mm)	Tolerance (mm)	Tensile strength (MPa) ⩾	Yield strength (MPa) ⩾	Elong at. max. force (%) ⩾	Bending number (times/180o) ⩾	Relaxation rate (%) ⩽
4.00	±0.04	1470	1290	3.5	3	2.5
4.50		1570	1380		4	
4.80		1670	1470			
5.00	±0.05	1770	1560			
		1860	1640			
6.00		1470	1290			
6.25		1570	1380			
7.00		1670	1470			
7.50		1770	1560			
		1860	1640			
8.00	±0.06	1470	1290			

9.00		1570 1670	1380 1470			
9.50						
10.00						
11.00		1470	1290			
12.00		1570	1380			

Prestressed concrete steel strand is made of several steel wires, including a central core wire surrounded by helically wound wires, ensuring enhanced structural integrity and load-bearing capacity. Prestressed steel strands are mainly used in large-span reinforced concrete structures, beams, columns, roads, and bridges of large-span buildings, as well as in high-speed railway bridges, highway bridges, subway tunnels, coal mines, large international airports, water conservancy dam construction, concrete protective walls of nuclear power plants, and high-rise buildings.

Figure 2 Prestressed concrete steel strand

Table 4 Specification of prestressed concrete steel strand

Structure	Nominal diameter (mm)	Tolerance (mm)	Cross section area (mm2)	Mass of 1km (kg/km)	Tensile grade (MPa)	Breaking force (kN) ⩾	Proof force (kN) ⩾	Elong. (%) ⩾	Relax. rate (%) ⩽
1x2	5.00	+0.15 -0.05	9.82	77.1	1570 1860 1960	15.4 18.3 19.2	13.6 16.1 16.9	3.5	2.5
	5.80		13.2	104		20.7 24.6 25.9	18.2 21.6 22.8		
	8.00	+0.25 -0.10	25.1	197		49.4 46.7 49.2	34.7 41.1 43.3		
	10.00		39.3	308		61.7	54.3		

						73.1 77.0	64.3 67.8		
	12.00		56.5	444	1570 1860	88.7 105	78.1 92.5		
1x3	6.20	+0.15 -0.05	19.8	155	1570 1720 1860 1960	31.1 34.4 36.8 38.8	27.4 30.0 32.4 34.1	3.5	2.5
	6.50		21.2	166		33.3 36.5 39.4 41.6	29.3 32.1 34.7 36.6		
	8.60	+0.25 -0.10	37.7	296		59.2 64.8 70.1 73.9	52.1 57.0 61.7 65.0		
	8.74		38.6	303	1570 1860	60.6 71.8	53.3 63.2		
	10.80		58.9	462	1570 1720	92.5 101 110 115	81.4 88.9 96.8 101		
	12.90		84.8	666	1860 1960	133 146 158 166	117 128 139 146		
1x7	9.50	+0.30 -0.15	54.8 74.2	420 582	1860 1960	102 107	89.8 94.2	3.5	2.5
	11.10				1860 1960	138 145	121 128		
	12.70	+0.40 -0.20	98.7	775	1860 1960	184 193	162 170		
	15.20		140	1101		260 274	229 241		
	15.70		150	1178	1770 1860	266 279	234 246		
	17.80		191	1500	1720 1860	327 355	288 311		
	18.90		220	1727	1820 1860	400 409	352 360		
	21.60		285	2237	1770 1860	504 530	444 466		
1x19	17.80	+0.40 -0.20	208	1652	1770 1860	368 387	334 341	3.5	2.5

	19.30		244	1931		431 454	379 400		
	20.30		271	2149	1770 1810 1860	480 491 504	422 432 444		
	21.80		313	2482		554 567 583	488 499 513		
	28.60		532	4229	1720 1770 1860	915 942 990	805 820 854		

Post tensioned unbonded prestressed steel strand is used for cast-in-place floor slabs of large-span and large-span buildings, prefabricated beams with high loads, and other special structures and special buildings. It does not require reserved holes or grouting; Features such as easy construction, material saving, and flexible bending.

Figure 3 Unbonded prestressed concrete steel strand

Table 5 Specification of 1x7 unbonded prestressed concrete steel strand

Nominal diameter (mm)	Tensile grade (MPa)	Cross section area (mm2)	Grease weight per meter (g/m) ⩾	Thickness of plastic (mm) ⩾	Frictional coefficient of side wall ⩽	Influence coefficient ⩽
Φ12.70	1860 1960	98.70	43	1.0	0.09	0.004
Φ15.20	1860 1960	140.00	50			
Φ15.24	1860	140.00	50			
Φ15.70	1860	150.00	53			

2.2 Description of the production process

The manufacturing process of prestressed concrete steel wire and strand products mainly includes coating, pickling, drawing, stranding, closing and packaging, which involves raw materials, packaging materials, energy and emissions. The figures below show the production process of products.

Figure 4 Production process flowchart of prestressed concrete steel wire

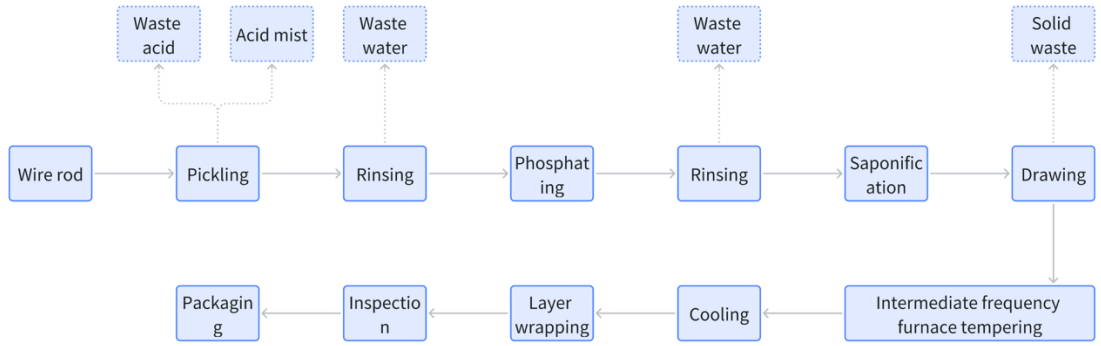


Figure 5 Production process flowchart of prestressed concrete steel strand

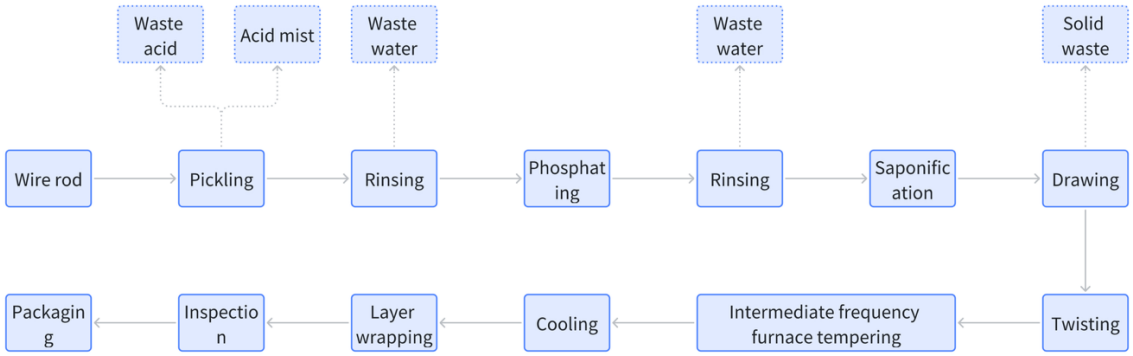
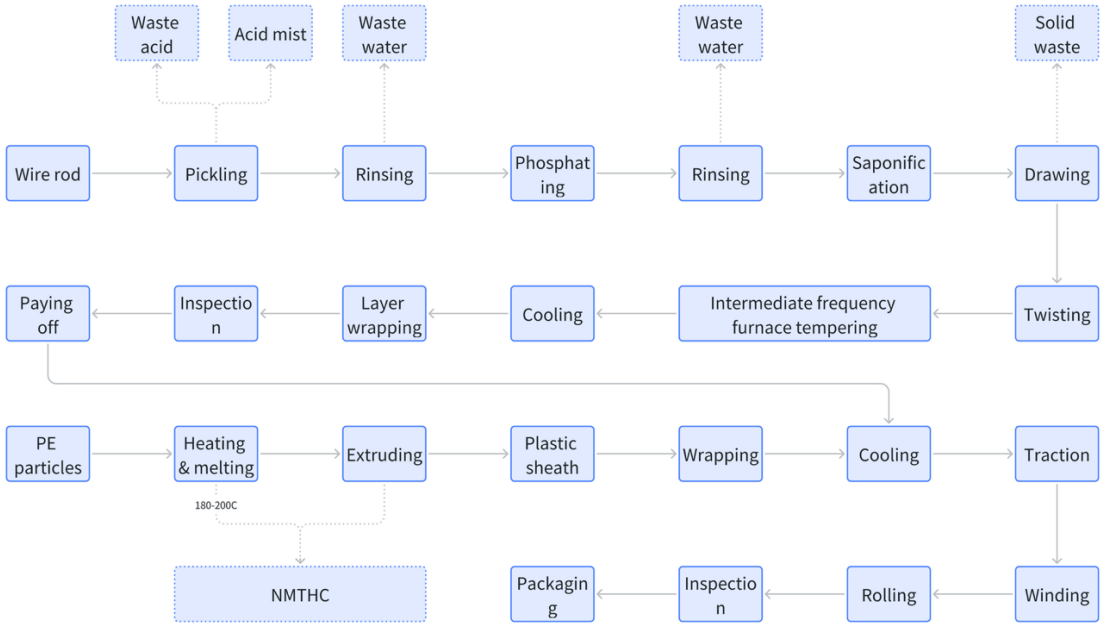


Figure 6 Production process flowchart of unbonded prestressed concrete steel strand



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

Table 6 Main product components and packaging materials per declared unit

Type of materials	Unit	PC steel wire	PC steel strand	Unbonded PC steel strand
Raw material				
Steel wire rod	t	1.0109		
Auxiliary materials				
Surface treatment agent	t	0.0026		
Film coating agent	t	0.0036		
Soap photos	kg	0.0030		
PE particles	t	/	/	0.0643
Oil	t	/	/	0.0418
Packaging				
Packaging film	kg	0.5669		
Wood pallet	kg	0.4122		
Steel strip	kg	2.0651		

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 Life cycle impact assessment result for PC steel wire

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.	2.76E+03	1.24E+02	9.28E-01	0.00E+00	1.01E+01	2.73E+01	2.65E+00	-1.56E+03
GWP-fossil	kg CO2 eq.	2.76E+03	1.24E+02	2.15E-01	0.00E+00	1.01E+01	2.72E+01	2.65E+00	-1.56E+03
GWP-biogenic	kg CO2 eq.	-7.13E-01	2.68E-02	7.14E-01	0.00E+00	2.28E-03	7.45E-02	6.51E-04	-1.99E-01
GWP-luluc	kg CO2 eq.	1.56E+00	5.71E-02	3.97E-06	0.00E+00	4.53E-03	3.88E-02	1.26E-03	-3.29E-01
ODP	kg CFC 11 eq.	1.26E-05	1.60E-06	1.63E-10	0.00E+00	1.28E-07	3.18E-07	4.31E-08	-4.07E-06
AP	mol H+ eq.	1.19E+01	8.63E-01	7.14E-05	0.00E+00	3.45E-02	2.78E-01	1.13E-02	-5.39E+00
EP-freshwater	kg P eq.	1.48E+00	1.23E-02	1.03E-06	0.00E+00	1.11E-03	1.41E-02	2.77E-04	-4.08E-01
EP-marine	kg N eq.	2.54E+00	2.40E-01	8.11E-04	0.00E+00	1.09E-02	6.46E-02	3.87E-03	-1.20E+00
EP-terrestrial	mol N eq.	2.73E+01	2.63E+00	3.23E-04	0.00E+00	1.19E-01	7.24E-01	4.22E-02	-1.32E+01
POCP	kg NMVOC eq.	9.25E+00	8.68E-01	1.01E-04	0.00E+00	4.68E-02	2.16E-01	1.60E-02	-4.47E+00
ADPE	kg Sb eq.	2.09E-02	3.68E-04	1.64E-08	0.00E+00	3.31E-05	1.44E-03	7.54E-06	-7.45E-04
ADPF	MJ, net calorific value	2.88E+04	1.69E+03	1.27E-01	0.00E+00	1.40E+02	3.33E+02	4.33E+01	-1.55E+04
WDP	m3 world eq. deprived	8.79E+02	7.36E+00	-5.53E-02	0.00E+00	6.50E-01	3.92E+00	7.98E-01	-1.11E+02

Table 8 Life cycle impact assessment result for PC steel strand

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.	2.94E+03	1.24E+02	9.28E-01	0.00E+00	1.01E+01	2.73E+01	2.65E+00	-1.56E+03
GWP-fossil	kg CO2 eq.	2.94E+03	1.24E+02	2.15E-01	0.00E+00	1.01E+01	2.72E+01	2.65E+00	-1.56E+03
GWP-biogenic	kg CO2 eq.	-7.13E-01	2.68E-02	7.14E-01	0.00E+00	2.28E-03	7.45E-02	6.51E-04	-1.99E-01
GWP-luluc	kg CO2 eq.	1.60E+00	5.71E-02	3.97E-06	0.00E+00	4.53E-03	3.88E-02	1.26E-03	-3.29E-01
ODP	kg CFC 11 eq.	1.32E-05	1.60E-06	1.63E-10	0.00E+00	1.28E-07	3.18E-07	4.31E-08	-4.07E-06
AP	mol H+ eq.	1.30E+01	8.63E-01	7.14E-05	0.00E+00	3.45E-02	2.78E-01	1.13E-02	-5.39E+00
EP-freshwater	kg P eq.	1.52E+00	1.23E-02	1.03E-06	0.00E+00	1.11E-03	1.41E-02	2.77E-04	-4.08E-01
EP-marine	kg N eq.	2.77E+00	2.40E-01	8.11E-04	0.00E+00	1.09E-02	6.46E-02	3.87E-03	-1.20E+00
EP-terrestrial	mol N eq.	2.97E+01	2.63E+00	3.23E-04	0.00E+00	1.19E-01	7.24E-01	4.22E-02	-1.32E+01
POCP	kg NMVOC eq.	9.90E+00	8.68E-01	1.01E-04	0.00E+00	4.68E-02	2.16E-01	1.60E-02	-4.47E+00
ADPE	kg Sb eq.	2.11E-02	3.68E-04	1.64E-08	0.00E+00	3.31E-05	1.44E-03	7.54E-06	-7.45E-04

ADPF	MJ, net calorific value	3.07E+04	1.69E+03	1.27E-01	0.00E+00	1.40E+02	3.33E+02	4.33E+01	-1.55E+04
WDP	m3 world eq. deprived	9.02E+02	7.36E+00	-5.53E-02	0.00E+00	6.50E-01	3.92E+00	7.98E-01	-1.11E+02

Table 9 Life cycle impact assessment result for unbonded PC steel strand

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.	3.09E+03	1.24E+02	9.28E-01	0.00E+00	1.01E+01	2.73E+01	2.80E+00	-1.56E+03
GWP-fossil	kg CO2 eq.	3.09E+03	1.24E+02	2.15E-01	0.00E+00	1.01E+01	2.72E+01	2.80E+00	-1.56E+03
GWP-biogenic	kg CO2 eq.	-7.12E-01	2.68E-02	7.14E-01	0.00E+00	2.28E-03	7.45E-02	6.60E-04	-1.99E-01
GWP-luluc	kg CO2 eq.	1.73E+00	5.71E-02	3.97E-06	0.00E+00	4.53E-03	3.88E-02	1.26E-03	-3.29E-01
ODP	kg CFC 11 eq.	1.63E-05	1.60E-06	1.63E-10	0.00E+00	1.28E-07	3.18E-07	4.32E-08	-4.07E-06
AP	mol H+ eq.	1.37E+01	8.63E-01	7.14E-05	0.00E+00	3.45E-02	2.78E-01	1.13E-02	-5.39E+00
EP-freshwater	kg P eq.	1.56E+00	1.23E-02	1.03E-06	0.00E+00	1.11E-03	1.41E-02	2.77E-04	-4.08E-01
EP-marine	kg N eq.	2.92E+00	2.40E-01	8.11E-04	0.00E+00	1.09E-02	6.46E-02	3.89E-03	-1.20E+00
EP-terrestrial	mol N eq.	3.12E+01	2.63E+00	3.23E-04	0.00E+00	1.19E-01	7.24E-01	4.23E-02	-1.32E+01
POCP	kg NMVOC eq.	1.15E+01	8.68E-01	1.01E-04	0.00E+00	4.68E-02	2.16E-01	1.60E-02	-4.47E+00
ADPE	kg Sb eq.	2.19E-02	3.68E-04	1.64E-08	0.00E+00	3.31E-05	1.44E-03	7.55E-06	-7.45E-04
ADPF	MJ, net calorific value	3.42E+04	1.69E+03	1.27E-01	0.00E+00	1.40E+02	3.33E+02	4.33E+01	-1.55E+04
WDP	m3 world eq. deprived	9.29E+02	7.36E+00	-5.53E-02	0.00E+00	6.50E-01	3.92E+00	8.03E-01	-1.11E+02

3.2 Resource use and waste categories

Table 10 Resource use of PC steel wire

RESULTS OF THE LCA - Resource use per declared unit									
Impact category	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERT	MJ	2.92E+03	2.22E+01	2.69E-03	0.00E+00	1.95E+00	4.55E+01	5.34E-01	-3.50E+02
PERM	MJ	5.33E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERE	MJ	2.92E+03	2.22E+01	2.69E-03	0.00E+00	1.95E+00	4.55E+01	5.34E-01	-3.50E+02
PENRT	MJ	2.88E+04	1.69E+03	1.27E-01	0.00E+00	1.40E+02	3.33E+02	4.33E+01	-1.55E+04
PENRM	MJ	1.39E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRE	MJ	2.88E+04	1.69E+03	1.27E-01	0.00E+00	1.40E+02	3.33E+02	4.33E+01	-1.55E+04
FW	m3	2.40E+01	2.17E-01	1.22E-03	0.00E+00	1.91E-02	1.25E-01	1.97E-02	-2.94E+00
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 11 Waste production of PC steel wire

RESULTS OF THE LCA - Waste categories per declared unit									
Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	2.21E-04	1.11E-05	1.08E-09	0.00E+00	9.43E-07	2.14E-06	2.86E-07	-1.78E-04
NHWD	kg	2.02E-01	6.89E-02	3.86E-04	0.00E+00	6.48E-03	1.05E-02	1.01E-01	-4.55E-02
RWD	kg	1.70E-05	3.15E-07	3.39E-11	0.00E+00	2.76E-08	2.63E-07	7.76E-09	-2.75E-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	2.58E+00	0.00E+00	0.00E+00	9.00E+02	0.00E+00	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	2.96E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 12 Resource use of PC steel strand

RESULTS OF THE LCA - Resource use per declared unit									
Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERT	MJ	3.07E+03	2.22E+01	2.69E-03	0.00E+00	1.95E+00	4.55E+01	5.34E-01	-3.50E+02
PERM	MJ	1.07E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERE	MJ	3.07E+03	2.22E+01	2.69E-03	0.00E+00	1.95E+00	4.55E+01	5.34E-01	-3.50E+02
PENRT	MJ	3.07E+04	1.69E+03	1.27E-01	0.00E+00	1.40E+02	3.33E+02	4.33E+01	-1.55E+04
PENRM	MJ	1.35E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRE	MJ	3.07E+04	1.69E+03	1.27E-01	0.00E+00	1.40E+02	3.33E+02	4.33E+01	-1.55E+04
FW	m3	2.45E+01	2.17E-01	1.22E-03	0.00E+00	1.91E-02	1.25E-01	1.97E-02	-2.94E+00
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 13 Waste production of PC steel strand

RESULTS OF THE LCA - Waste categories per declared unit									
Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	2.27E-04	1.11E-05	1.08E-09	0.00E+00	9.43E-07	2.14E-06	2.86E-07	-1.78E-04
NHWD	kg	2.08E-01	6.89E-02	3.86E-04	0.00E+00	6.48E-03	1.05E-02	1.01E-01	-4.55E-02
RWD	kg	1.76E-05	3.15E-07	3.39E-11	0.00E+00	2.76E-08	2.63E-07	7.76E-09	-2.75E-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	2.58E+00	0.00E+00	0.00E+00	9.00E+02	0.00E+00	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	2.96E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	5.78E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 14 Resource use of unbonded PC steel strand

RESULTS OF THE LCA - Resource use per declared unit									
Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERT	MJ	3.21E+03	2.22E+01	2.69E-03	0.00E+00	1.95E+00	4.55E+01	5.35E-01	-3.50E+02
PERM	MJ	1.07E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERE	MJ	3.21E+03	2.22E+01	2.69E-03	0.00E+00	1.95E+00	4.55E+01	5.35E-01	-3.50E+02
PENRT	MJ	3.42E+04	1.69E+03	1.27E-01	0.00E+00	1.40E+02	3.33E+02	4.33E+01	-1.55E+04
PENRM	MJ	1.14E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRE	MJ	3.42E+04	1.69E+03	1.27E-01	0.00E+00	1.40E+02	3.33E+02	4.33E+01	-1.55E+04
FW	m3	2.53E+01	2.17E-01	1.22E-03	0.00E+00	1.91E-02	1.25E-01	1.99E-02	-2.95E+00
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 15 Waste production of unbonded PC steel strand

RESULTS OF THE LCA - Waste categories per declared unit									
Impact category	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	2.51E-04	1.11E-05	1.08E-09	0.00E+00	9.43E-07	2.14E-06	2.87E-07	-1.78E-04
NHWD	kg	2.20E-01	6.89E-02	3.86E-04	0.00E+00	6.48E-03	1.05E-02	1.01E-01	-4.55E-02
RWD	kg	1.92E-05	3.15E-07	3.39E-11	0.00E+00	2.76E-08	2.63E-07	7.77E-09	-2.76E-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	2.58E+00	0.00E+00	0.00E+00	9.00E+02	0.00E+00	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	2.96E-04	0.00E+00	0.00E+00	0.00E+00	2.53E-01	0.00E+00
EET	MJ	0.00E+00	0.00E+00	5.78E-04	0.00E+00	0.00E+00	0.00E+00	4.93E-01	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 16 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	0.1946 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, in product transportation stage (A4), domestic transport is assumed as 500km land transportation, overseas (SEA) transport is assumed as 100km land transportation in China and 500km land transportation in Malaysia.
- It is assumed that no specialized deconstruction or demolition processes are required for the prestressed concrete steel wire and strand products.
- During the end-of-life stage, the transportation of the waste prestressed concrete steel wire and strand from the operation site to treatment facilities such as dismantling site and disposal facilities is assumed to be 100km 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.

It is estimated that the largest omitted mass flow in the product life cycle is associated with production stage, but it does not exceed 1% of total mass flow in the worst-case scenario. It is estimated that environmental relevance over impact categories during whole product life cycle does not exceed 1% in the worst-case scenario.

Cut-off criteria were applied to capital equipment production and maintenance. It was assumed that the impacts associated with these aspects were sufficiently small enough to fall below cut-off when it is scaled down to the declared unit.

Material and energy flows known to have the potential to cause significant emissions into air and water or soil related to the environmental indicators of this study will be included in the assessment. So far according to review of the Material Safety Data Sheet (MSDS) and relevant physical, chemical and other information of the flows listed in table above, no significant negative emission to the environment from above listed flows is identified.

Excluded processes

The following steps/stages are not included in the system boundary due to the reason that the elements below are considered irrelevant or not within the boundary to the LCA study of prestressed concrete steel wire and strand products:

- 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 prestressed concrete steel wire products.
- Prestressed concrete steel wire 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.

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 and Ecoinvent database is used for the model. For more of the data information, please refer to section 9 of transparency documentation.

This report covers s prestressed concrete steel wire and strand products in Tianjin and provided data for the period January to December 2025. 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 China and SEA. Background data was sourced from the Ecoinvent 3.11 database. No poor or very poor data was found during the assessment of relevant data using EN 15804:2012+A2:2019, Annex E.

Allocations

Allocation refers to partitioning of input or output flows of a process or a product system between the product systems under study and one or more other product systems. 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 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 prestressed concrete steel wire and strand product.

4.2 Scenarios and additional technical information

Raw materials transportation

The transportation mainly takes place on the upstream of raw materials, auxiliary materials and packaging materials supply and downstream of product delivery. All the materials, except packaging film, are delivered within a radius of 200km distance, mainly from north China where the manufacturing site is located. The information related to transportation including distance and vehicle is shown in table below.

Table 17 Transportation of raw materials, auxiliary materials and packaging materials

Materials	Source	Distance/km	Vehicle
Steel wire rod	Tianjin	14	Lorry
Surface treatment agent	Tianjin	30.5	Lorry
Film coating agent	Tianjin	12	Lorry
Soap photos	Tianjin	42	Lorry
PE particles	Beijing	144.8	Lorry
	Hebei	83	Lorry
Oil	Hebei	95.8	Lorry
Packaging film	Ningbo	1108.9	Lorry
Wood pallet	Tianjin	11.5	Lorry
Steel strip	Tianjin	29.5	Lorry

Manufacturing

The manufacturing process of prestressed concrete steel wire and strand products mainly includes coating, pickling, drawing, stranding, closing and packaging. Raw materials, auxiliary materials, packaging materials are listed in section table above. The life cycle inventory data of prestressed concrete steel wire and strand products including input and output data of energy and emissions see table below. All the life cycle inventory data of manufacturing is calculated and submitted by the factory of Dejia. Flow ratio and value based on calculation and expert judgment instead of monitoring result and record is used for this LCA study, an additional detailed transparency documentation listing the assumption and calculations for the distribution of the results among product series and product stages are provided for further reference in the end of this report.

Table 18 Energy and Output waste of manufacturing

Material/Energy/Process		Unit	Prestressed concrete steel wire	Prestressed concrete steel strand	Unbonded prestressed concrete steel strand
Input					
Electricity (NCGC)		kWh	179.74	321.90	352.98
Electricity (PV-TJ)		kWh	11.37	20.36	22.32
Water		t	0.0113	0.0985	0.0455
Natural gas		m3	0.0386	0.3354	0.1550
Alkali tablets		kg	0.0001	0.0013	0.0006
Water treatment	Polyaluminum chloride	kg	0.0010	0.0084	0.0039
	polyacrylamide cation	kg	0.0001	0.0008	0.0004

Output				
Waste water	t	0.0113	0.0985	0.0455
Waste gas HCl	kg	0.0526	0.4573	0.2114
Waste gas PM	kg	0.0056	0.0485	0.0224
Waste gas SO2	kg	0.0069	0.0597	0.0276
Waste gas Nox	kg	0.0788	0.6854	0.3168
Waste gas VOC	kg	0.0068	0.0591	0.0273
Waste gas NMHC	kg	0.0072	0.0623	0.0288
Slag	kg	0.3958	3.4411	1.5903
Waste acid	t	0.1362	1.1841	0.5472
Rust	t	0.0605	0.5259	0.2430
Waste strand	t	0.3647	3.1713	1.4656

In this study, the grid mix data on electricity of for the site in Tianjin is based on grid mixes of the State Grid North China Branch (NCGC) and PV-TJ. The electricity inventory is based on the year of 2022 for Chinese electricity generation (China Energy Statistics). The GHG emission of NCGC is 1.05 kg CO2 eq/kWh. Plus, the PV is also used in manufacturing of prestressed concrete steel wire and strand, and the GHG of PV-TJ is 0.078 kg CO2 eq/kWh.

Transportation of products

According to the factory, prestressed concrete steel wire and strand products are consumed in China and SEA. Road and oceanic transportation distance for product delivery is estimated with reference from external resources. Specifically, domestic transport is assumed as 500km land transportation, overseas (SEA) transport is assumed as 100km land transportation in China and 500km land transportation in Malaysia. Sea transport is 2947 nautical miles, which equals 5508 km, from Tianjin port to port Kelang, sourcing: https://sea-distances.org.

Table 19 Transportation of products

Market location	Ratio	Distance (km)	Vehicle
Chian	70%	500	Lorry
SEA	30%	100	Lorry
		5508	Ship
		500	Lorry

Installation

The installation of prestressed concrete steel wire and strand 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 Dejia, the target market of prestressed concrete steel wire and strand products is China and 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 strip 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 20 Packaging disposal in the target market

Nation	Packaging type	Recycling	Landfill	Incineration
China	Metal	100%	0%	0%
	Wood	100%	0%	0%
	Plastic	25%	56%	19%
SEA	Metal	100%	0%	0%
	Wood	100%	0%	0%
	Plastic	5%	95%	0%

End-of-life

The disposal of the used prestressed concrete steel wire and strand 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 prestressed concrete steel wire and strand 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) and typical distance of 100 km 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 final disposal (C4) of landfill (Steel Construction Institute, 2012). Also, the transportation to landfill is also considered in C4 stage.

Table 21 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	100 (lorry)	km
C3	Waste for recycling (Sorting and pressing of iron scrap)	90	%
C4	Waste for final disposal - landfill	10	%
	Transport to landfill	100 (lorry)	km

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. Pig iron 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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