

Environmental Product Declaration



In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:

PC-strand – Prestressed steel for reinforcement of concrete

from

Hjulsbro Steel AB



Programme:	The International EPD® System, www.environdec.com
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2019:14 Construction products, version 1.0
PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact .
Independent third-party verification of the declaration and data, according to ISO 14025:2006: <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification
Third party verifier: DNV GL Business Assurance Italia S.r.l.
Accredited by: Accredia
Procedure for follow-up of data during EPD validity involves third party verifier: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

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EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD:

Hjulsbro Steel AB

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Organization no 556259-6899

<https://hjulsbrosteel.com>

Contact: Fredrik Axelsson

Description of the organisation: Hjulsbro Steel is an independent developer, producer and distributor of customized long steel products for high-quality applications. In a modern rolling mill and state-of-the-art wire processing center Hjulsbro Steel produces untreated and treated wire rod and drawn wire.

Product-related or management system-related certifications: Certified management systems are ISO 9001 and ISO 14001.

Name and location of production site(s): Hjulsbro Steel, Linköping, Sweden

Product information

Product name: PC-strand

UN CPC code: 412

Product identification: Uncoated 3-wire and 7-wire steel PC-strand. 3-wire in dimensions from 6.5mm to 7.5mm, 7-wire in dimensions from 9.3mm to 15.7mm.

Product description: The product studied are low alloyed steel wire rods that are drawn to smaller dimensions and twined into strands for use in prestressed concrete structures, also known as PC-strand Hjulsbro Steel's PC-strand product range consist of 3- and 7- wire strands made from high-quality wire rod in various steel grades depending on application. The detailed specifications of each PC –strand, such as dimensions and mechanical properties vary depending on the product ranges. The typical product composition of PC- strand is described in the table below:

Element	%
Iron	97,8
Carbon	0,82
Silicon	0,26
Manganese	0,72
Phosphorus	0,0065
Sulfur	0,0094
Copper	0,085
Chromium	0,22
Nickel	0,055
Molybdenum	0,013
Aluminum	0,0018
Nitrogen	0,0046
Titanium	0,0076
Vanadium	0,0020



Application

The PC-Strand product range is used primarily for prefabricated concrete elements, hollow core slabs, beams, TT-slabs or railway sleepers and in post tensioning constructions such as bridges or silos.

Delivery status

The dimensions of the declared product may vary according to the particular requirements of the construction project. For transportation and storage, the PC- strands are winded into coils.

Technical information

All PC-Strands are available with either plain or indented surface. The standard tensile strength is 1860 MPa, but other strengths are available. The 3-wire strand wires are of uniform thickness. In our 7-strands, the core wire diameter is at least 3 % greater than that of the outer helical wires.

The standard geometric and mechanical properties of each coil are tested in our own laboratory in accordance with the EN ISO 15630-3 standard. Hjulstro Steel is also constantly monitored by the relevant standards authorities, ensuring that product standards are fully met.

The PC-Strands are delivered in precision-wound coils and have excellent pay-off properties. The standard coil weight for 3-wire strands is 1.4 or 2 tons, and 3, 4 and 5 tons for 7-wire strands coils. Bespoke coils can also be manufactured to customer specifications.

LCA information

Functional unit / declared unit: 1 kg PC- strand at the factory gate plus end-of life and resource recovery stages

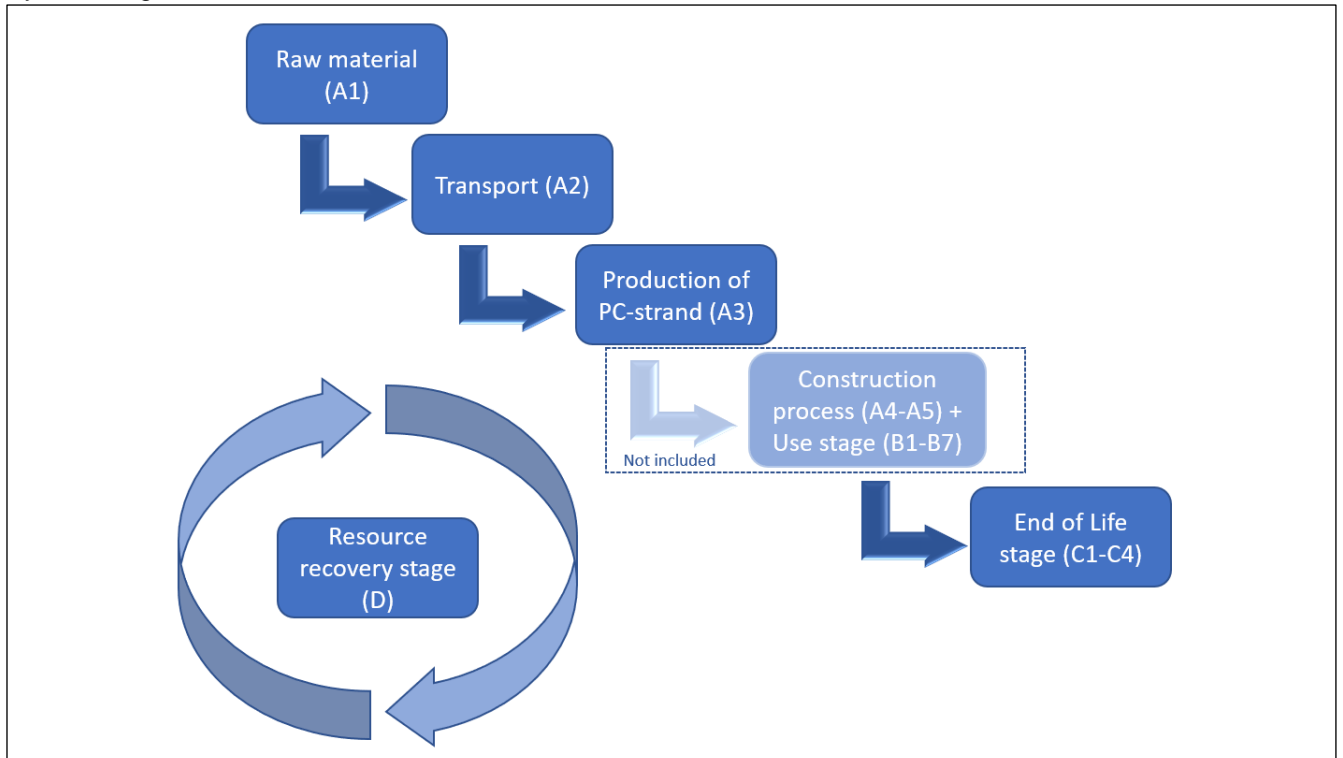
Time representativeness: Mainly 2019, not older than 6 years.

Database(s) and LCA software used: SimaPro 9, Ecoinvent 3.6

Description of system boundaries:

Cradle to gate with modules C1–C4 and module D (A1–A3 + C + D)

System diagram:



More information:

No benefits beyond the benefits discounted by the use of scrap as raw material in A1. Loads corresponding to the loss of steel in C1-C4.

Specific energy information

Electricity used in the core process at Hjulbro Steel is 100% hydro power, 0,012 kg CO2/kWh.

Cut- off criteria

All major raw materials and the essential energy is included. Maintenance in the manufacturing process according to assumption that the impacts associated with these aspects are sufficiently small enough to fall below cut-off criteria of 5% when scaled down to the declared unit. Packaging related to delivery of raw materials and transport of raw material packaging also falls below the cut off criteria, since there is no packaging related to delivery of the wire rods. Other packaging is therefore well below the cut off criteria in relation to the declared unit. Emissions released from the manufacturing (or technosphere) to air, soil and water is considered to be very small and therefore assessed to not be affecting the results in a significant way. These data are consequently excluded in the LCA.

Data quality

Data for use in module A3 is collected directly from the manufacturing process and consist of energy consumption and recorded amount of material for the PC- strand. The data used in module A1 is provided by suppliers of the wire rod and related components. The geographic region of the production site (A3) included in the calculation is Sweden. Data for A1- A2, C1-C4 and D represents the rest of the world. A2 are representing both internal and external transport. Generic data used in the EDP are not older than 6 years and site-specific data are not older than 3 years. Explanatory material may be obtained via contacting Hjulbro Steel AB.

Methodology

This declaration is a cradle to gate with modules developed within the International EPD System and based on the application of a Life Cycle Assessment (LCA) methodology. The LCA study was performed using SimaPro 9 software.

Allocation

Allocation between products or co-products have not been relevant due to that are no co-products in the production of the PC-strand.

Average product

The two different PC-strand types (3- and 7-wire) is presented as an average product, since the environmental impact differences between them are very small (6,1 % for GWP-GHG CO₂-equivalents/kg).

Modules declared, geographical scope, share of specific data and data variation:

	Product stage		Construction process stage			Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	SE, UK, DE, NO, ES, US	SE, UK, DE, NO, ES, US	SE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Specific data	70%					-	-	-	-	-	-	-	-	-	-	-	-

Content information

Product components	Weight, kg
Steel	1
Packaging materials	Weight, kg
Wood	0,00286
Plastic (PET)	0,000194
Steel sheet metal band	0,0008

The product contains no substances included in the REACH Candidate list (Substance of Very High Concern).

Environmental Information

Note that the impact categories below are only representing the impact potentials, which means that they are approximations of environmental impacts that could occur.

Potential environmental impact – mandatory indicators according to EN 15804

Results per declared unit									
Production stage					End of life stage				Resource recovery stage
Parameter	Unit	A1-A2	A3	A1-A3	C1	C2	C3	C4	D
GWP-total	Kg CO ₂ - Eq	1,82	0,0437	1,866	0,00550	0,00817	0,0185	0,000665	-0,772
GWP-fossil	Kg CO ₂ - Eq	1,82	0,0089	1,83	0,00550	0,00817	0,0198	0,000656	-0,771
GWP-biogenic	Kg CO ₂ - Eq	0,00422	0,0348	0,0390	1,47E-06	4,39E-06	-0,0013	8,14E-06	-0,000325
GWP-luluc	Kg CO ₂ - Eq	0,00132	1,22E-05	0,00133	2,37E-07	2,91E-06	2,39E-05	1,61E-07	-0,000529
ODP	Kg CFC11 - Eq	1,35E-07	8,17E-10	1,36E-07	1,2E-09	1,86E-09	2,66E-09	2,48E-10	-4,36E-08
AP	Mol H+ Eq	0,00891	6,5E-05	0,00897	7,79E-05	2,35E-05	0,000257	5,84E-06	-0,00407
EP-freshwater	Kg (PO ₄) - Eq	0,000908	2,28E-06	0,00091	8,21E-08	6,08E-07	1,89E-05	1,99E-07	-0,000545
EP-marine	Kg N Eq	0,00200	9,68E-05	0,0021	3,48E-05	4,75E-06	5,57E-05	2,18E-06	-0,000914
EP-terrestrial	Mol N Eq	0,0209	0,000244	0,0211	0,000381	5,2E-05	0,000632	2,39E-05	-0,00910
POCP	Kg NMVOC - Eq	0,00923	7,47E-05	0,00931	9,97E-05	1,99E-05	0,000172	6,85E-06	-0,00373
ADP-minerals & metals*	Kg Sb- Eq	1,75E-05	5,27E-08	1,76E-05	5,1E-09	2,25E-07	1,2E-06	5,91E-09	-1,32E-05
ADP-fossil	MJ	22,2	0,0896	22,3	0,0742	0,123	0,272	0,0181	-8,46
WDP	M3 depriv.	0,607	0,00432	0,612	3,37E-05	0,000349	0,00299	8,22E-05	-0,130
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

* 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.

Potential environmental impact – additional mandatory and voluntary indicators

Results per declared unit			
Indicator	Unit	Product type	Tot.A1-A3
GWP-GHG*	kg CO ₂ eq.	Average product	1,77
GWP-GHG*	kg CO ₂ eq.	3-wired PC-strand	1,68
GWP-GHG*	kg CO ₂ eq.	7-wired PC-strand	1,79

*The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Use of resources

Results per declared unit									
Parameter	Unit (kg)	A1-A2	A3	A1-A3	C1	C2	C3	C4	D
PERE	MJ	1,75	0,000195	1,75	0,00177	0,0485	0,000647	-0,787	1,65
PERM	MJ	0	0	0	0	0	0	0	0
PERT	MJ	1,75	0,000195	1,75	0,00177	0,0485	0,000647	-0,787	1,65
PENRE	MJ	23,6	0,0788	23,7	0,131	0,288	0,0192	-8,97	0,0956
PENRM	MJ	0	0	0	0	0	0	0	0
PENRT	MJ	23,6	0,0788	23,7	0,131	0,288	0,0192	-8,97	0,0956
SM	KG	0,438	0,438	0,876	0	0	0	0	0,92
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
Net use of freshwater	m ³	0,0101	4,05E-05	0,0101	2,16E-06	2,32E-05	5,43E-05	8,34E-06	-0,00376
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

Waste production and output flows

Results per declared unit									
Parameter	Unit	A1	A2	A3	C1	C2	C3	C4	D
HWD	Kg	0,00275	0	0,0429	0	0	0	0	0
NHWD	Kg	0,00498	0	0,00261	0	0	0	0	0
RWD	Kg	0	0	0	0	0	0	0	0
CRU	Kg	0,00474	0	0	0	0	0	0	0
MFR	Kg	0	0	0	0,92	0	0,92	0	0,89
MER	Kg	0	0	0	0	0	0	0	0
EE	Kg	0	0	0	0	0	0	0	0
Acronyms	HWD= Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive Waste disposed; CRU = Components for re-use; MRF = Materials for recycling; MER = Materials for energy recovery; EE= Exported energy,								

Other environmental indicators

Results per declared unit										
Impact category	Unit	Production stage				End of life - stage				Resource recovery stage
		A1-A2	A3	A1-A3	C1	C2	C3	C4	D	
Particulate Matter emissions	disease inc.	1,69E-07	1,21E-09	1,71E-07	9,86E-11	5,21E-10	3,22E-09	1,25E-10	-7,44E-08	
Ionizing radiation, human health	kBq U-235 eq	0,144	0,000432	0,145	0,000333	0,000638	0,00302	0,000110	-0,0411	
Eco-toxicity (freshwater)	CTUe	56,2	0,482	56,7	0,0405	0,0995	1,31	0,0108	-35,5	
Human toxicity, cancer effects	CTUe	1,66E-08	2,94E-11	1,66E-08	4,2E-13	2,77E-12	3,15E-11	4,15E-13	-6,99E-09	

Human toxicity, non-cancer effects	CTUe	3,23E-07	3,76E-10	3,23E-07	6,11E-11	1,05E-10	1,52E-09	7,33E-12	-8,51E-08
Land use related impact/Soil quality	Pt	6,45	0,653	7,10	0,00915	0,0864	0,597	0,0466	-2,97

References

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