ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	voestalpine AG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-VOE-20230108-IBC2-EN
Issue date	09.05.2023
Valid to	08.05.2028

Drawn Wire - Prestressing Wire and Strand

voestalpine Wire Austria GmbH

Institut Bauen und Umwelt e.V.

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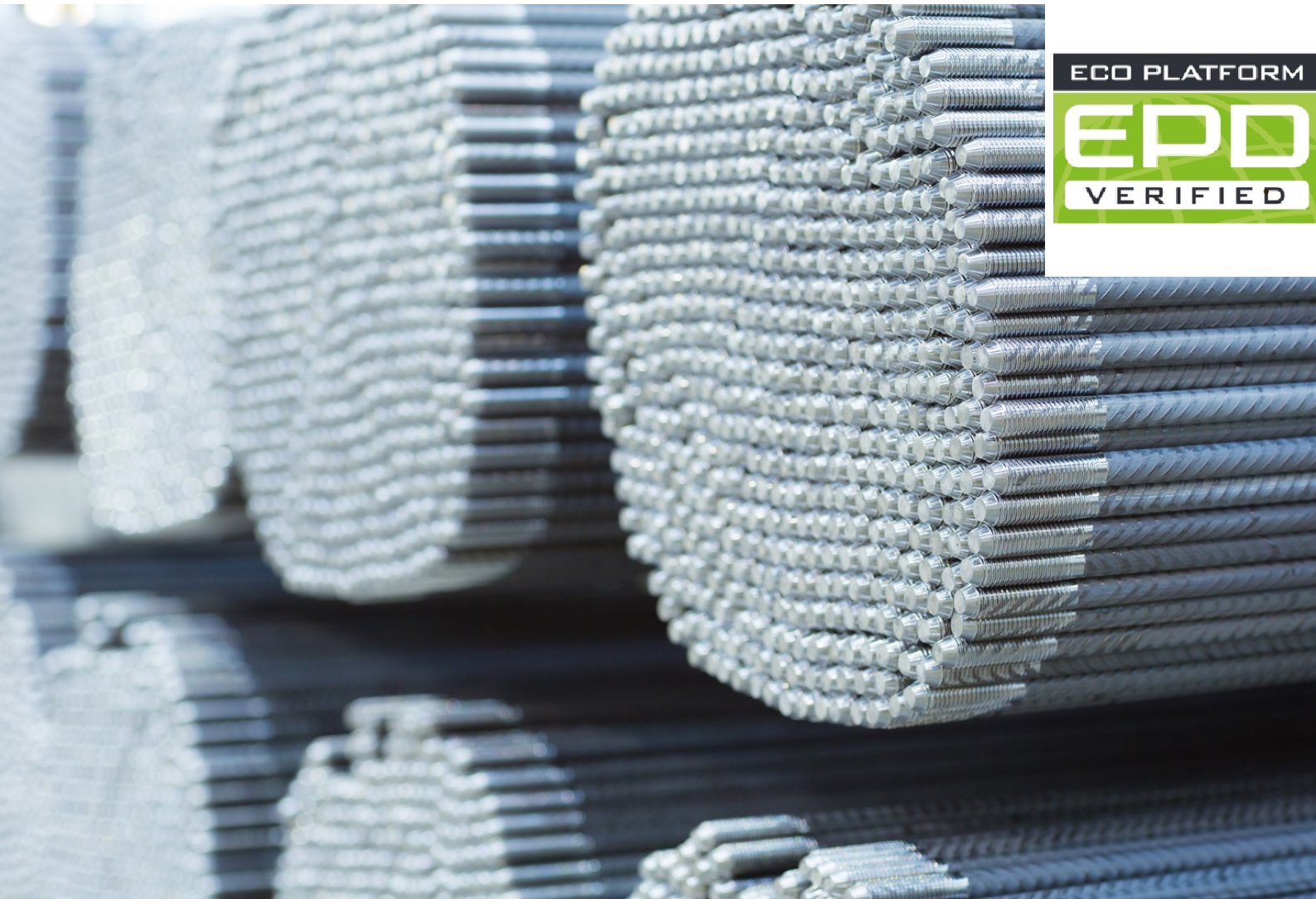


1. General Information

voestalpine Wire Austria GmbH

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-VOE-20230108-IBC2-EN

This declaration is based on the product category rules:

Structural steels, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

09.05.2023

Valid to

08.05.2028

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Drawn Wire - Prestressing Wire and Strand

Owner of the declaration

voestalpine AG
voestalpine-Straße 3
4020 Linz
Austria

Declared product / declared unit

1 tonne of prestressing steel

Scope:

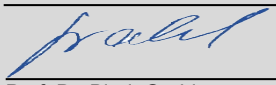
This EPD is based on a declared unit of 1 metric tonne of average voestalpine prestressing steel produced at the production site in Bruck a.d. Mur (Austria).

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally



Prof. Dr. Birgit Grahl,
(Independent verifier)

2. Product

2.1 Product description/Product definition

Prestressing wires and strands are used for reinforcing concrete structures, such as large-span bridges, rock-soil anchoring solutions, multi-storey industrial buildings, stadiums, mines, sleepers etc.

The prestressing wires are produced according to *FprEN 10138-2:2009* besides many other standards and homologations. Diameters range from 5.0 up to 10.5 mm.

Our 7-wire prestressing strands are supplied with cross-sectional areas ranging from 139 to 165 mm², depending on customer requirements, and with smooth or compacted surface. Compacted prestressing strands have a cross-sectional area of 165 mm². All strands exhibit very low relaxation. They are produced according to *FprEN 10138-3:2009* besides other standards and homologations. Diameters range from 15.2 to 15.7 mm for bare and compacted strands.

voestalpine Wire Technology also manufactures a variety of strand types with corrosion protection. The strands can be oiled, galvanized and additionally greased or waxed and PE-coated. Due to their excellent properties, these products are suitable for a wide variety of uses.

The prestressing products are manufactured under ideal processing conditions to ensure they meet the most demanding quality standards.

- Continuous quality inspections and many special testing options
- End-to-end traceability of all production and test parameters
- Greatest possible flexibility as the result of an integrated production chain
- Strict adherence to schedules, and partnerships with our customers
- Technical and sales service

For the use and application of the product the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

2.2 Application

Prestressing wires are mainly used for prestressing of concrete sleepers but can find their application also in prefabricated parts, beams, or reinforced tubes. Bare strands and PE-coated strands for prestressed concrete are suitable for large-span and large bays cast-in-place concrete floors, precast elements and beams and other special structures. As an additional application, these strands can be used in wind tower construction and anchoring systems. Galvanized and PE-coated strands mainly are used in stay-cable bridges.

2.3 Technical Data

The prestressing wires are produced according to *FprEN 10138-2:2009* besides other standards and homologations. The technical data given for the products are generic literature data for steel as described e.g. in *Key to Steel*. No product specific test rules are applicable to the data given.

Diameter and tensile strength class of Prestressing Wires:

Diamter [mm]	Tensile Strength [MPa]
5,0	1860
6,0	1770
6,5	1670 / 1770
7,0	1670
7,5	1670
8,0	1670
9,4	1570
9,5	1570
10,5	1570

The prestressing strands are produced according to *FprEN 10138-3:2009* besides other standards and homologations.

Diameter and tensile strength class of Prestressing Strands:

Diamter [mm]	Cross section [mm²]	Tensile Strength [Mpa]
15,2	139	1770 / 1860 / 1960
15,3	140	1770 / 1860 / 1960
15,7	150	1770 / 1860 / 1960
15,2	165	1820 / 1860

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

2.4 Delivery status

The prestressing wires can be delivered in coils, bars, threaded bars or threaded hairpins.
The prestressing strands can be delivered in coils or on wooden reels.

2.5 Base materials/Ancillary materials

Base materials:
The starting product for prestressing steel is hot-rolled wire, which is produced at the voestalpine Wire Rod Austria site. The basic material for this is in turn crude steel, which consists of about 85 % pig iron and about 15 % scrap.

The corrosion protection is given by oiling, galvanizing, greasing or waxing and PE-coating.

The mass of zinc for galvanized strands is 190 –350 g/m².
The minimum sheathing thickness of PE-coated strands is 1.25 mm.

For our extrusion technology different HDPE-types like HDPE80, HDPE100 or HDPE100+ can be used.

This product/article/at least one partial article contains substances listed in the *candidate list* (date: 16.1.2020) exceeding 0.1 percentage by mass: **no**.

This product/article/at least one partial article contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the *candidate list*, exceeding 0.1 percentage by mass: **no**.

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a

treated product as defined by the (EU) *Ordinance on Biocide Products* No. 528/2012): **no**.

2.6 Manufacture

Manufacturing of prestressing strands

The starting process is the pickling process. During pickling scale and rust from the surface of the wire rod coil are removed by dipping into hydrochloric acid. After several other treatments like phosphate coating and borax coating the wire rod coil is prepared for the next step cold drawing.

On the drawing line, the single wire is drawn to the final diameter on a spool. Seven of these spools finally are lifted into the skip strander, where a seven-wire prestressing strand is produced. The main process during stranding is the thermomechanical treatment (pulling and heating = stabilizing) to finally get the special properties like low relaxation and good ductility on a high tensile level.

In case of a galvanized strand the wire is pre-drawn and galvanized in our hot dip galvanizing line. After galvanizing the final drawing and the stranding remain the same.

In case of HDPE-coated strands, the smooth, compacted or galvanized strands are greased or waxed and afterwards HDPE-coated in our extrusion line. We can produce the coated strands from coil to coil either as reelless coils or on wooden reels.

Manufacturing of prestressing steel wires

The starting process is the pickling process. During pickling scale and rust from the surface of the wire rod coil are removed by dipping into hydrochloric acid. After several other treatments like phosphate coating and borax coating the wire rod coil is prepared for the next step cold drawing.

On the combined drawing and stabilizing line, the single wire is drawn to the final diameter either in coils or in bars. The main process during drawing is the thermomechanical treatment (pulling and heating = stabilizing) to finally get the special properties like low relaxation and good ductility on a high tensile level.

The wires in coils are directly sent to final customers, the wires in bars can be additionally bent and threaded or just only threaded at the end of the bars. Thus, all different types of wires needed for sleeper production (bars, threaded bars, coils or threaded hairpins) can be provided.

2.7 Environment and health during manufacturing

The voestalpine Wire Austria site is certified according to *EMAS III, ISO 9001, ISO 50001 and ISO 14001*. As part of the environmental declarations required by EMAS, voestalpine continuously publishes environmentally relevant data and facts about the site.

At the Bruck/Mur site, investments are constantly being made in the expansion of environmental protection measures in order to be able to reduce emissions to air and water to a minimum.

All operating facilities that have been approved in accordance with the environmental impact assessment procedure are also periodically inspected by the authorities as part of environmental inspections.

2.8 Product processing/Installation

voestalpine drawn wire can be processed using cold-forming methods, such as cold heading, spring coiling, etc.. Such processing methods do not produce any emissions or other harmful influences that emanate from the declared product.

2.9 Packaging

The declared product is delivered as described in 2.4. The packaging can consist of paper (coated), steel straps (circumferential straps as well as axle hole straps) and cardboard tubes and varies depending on the delivery. The packaging can be completely recycled.

2.10 Condition of use

Prestressing wires and strands are well protected either in the concrete structure or by using HDPE-pipes as an additional outer protection in case of stay-cable-bridges. Due to this fact, changes in material composition or changes of environmentally relevant inherent properties can be excluded.

2.11 Environment and health during use

During the use of our prestressing products on site no danger for environment and health can occur, because of the dry and clean or well protected surface. Of course all relevant safety instructions on site have to be followed strictly.

2.12 Reference service life

The reference useful life depends on the type of application and is usually between 15 and 50 years. Corrosive atmospheres have to be avoided to guarantee a full lifetime of functionality.

2.13 Extraordinary effects

Fire

Not relevant.

Water

No negative consequences for the environment are to be expected under the influence of water.

Mechanical destruction

Unforeseen mechanical impact on the declared product has no negative consequences on the environment due to the plastic deformability of steel.

2.14 Re-use phase

Wire from voestalpine can either be reused or recycled and reintroduced into the steel industry as a secondary raw material via recycling companies.

2.15 Disposal

The declared product can be fully used as a recycling raw material. The waste code according to the *European Waste Catalogue* is: 17 04 05. The waste type is equivalent to the key number 35103 according to the nationally applicable Waste Catalogue by-law.

2.16 Further information

Further information on the product is available on the website at https://www.voestalpine.com/wiretechnology/en/company/product-earch/Prestressing-Wire/

3. LCA: Calculation rules

3.1 Declared Unit

This environmental product declaration refers to a declared unit of 1 tonne of average prestressing steel.

Declared unit

Name	Value	Unit
Declared unit	1	t
Density	7850	kg/m^3

For the calculation of the declared average, input and production quantities for the entire calendar year 2018 were taken into account and broken down to the declared product group. The calculated results can thus be considered representative for the declared product portfolio of prestressing steel of voestalpine Wire Austria GmbH.

A linear correlation of the environmental impacts with the product weight is to be expected. Therefore, the conversion from the declared unit to a specific product is possible using a mass-specific scaling factor.

3.2 System boundary

The life cycle assessment of average prestressing steel refers to a cradle-to-gate analysis with modules (A1–A3 + C +D). Subsequent life cycle phases are part of the analysis:

Module A1–A3 | Production stage
The production stage includes the burdens of the production of prestressing steel of voestalpine Wire Austria GmbH at the production site in Bruck a.d. Mur. Most of the used steel wire is provided by the voestalpine Wire Rod Austria from St. Peter Freienstein. Thus, the upstream environmental impact of the steel supplied is represented by primary data of the respective production site. Material and energy flows for the pickling, drawing, cold rolling and galvanizing are considered. Electricity at Bruck a. d. Mur is provided from 100 % renewable energy (emission factor GWP-total: 14 g CO_2-equivalents/kWh). Thermal energy provision is based on natural gas. Module A1–A3 also includes the production of the packaging.

Module C1 | Deconstruction and demolition
It is assumed that the product is not connected with other materials and can therefore be dismantled. Associated efforts are negligible, no environmental impacts from the deconstruction of the products are declared.

Module C2 | Transport
The transport to the disposal of the material is estimated declaring a 50 km radius to the waste processing.

Module C3 | Waste processing
Product flows that reach Module D for recycling leave the product system in C3. Environmental impacts resulting from the grinding and sorting of steel scrap are not included due to the negligible expected environmental impact.

Module C4 | Landfilling
Module C4 declares the environmental impacts incurred by landfilling (5 % of the product).

Module D | Benefits and loads beyond the system boundary
The potential for substituting primary steel with a recycling scenario (95 % of the product) is outlined in Module D.

3.3 Estimates and assumptions

All assumptions are verified through detailed documentation and correspond to the best possible representation of reality based on the available data. Regional applicability of the used background data refers to average data under European or German conditions taken from the *GaBi*-database. German data were used for the Austrian market whenever European or Austrian average data were not available.

3.4 Cut-off criteria

All inputs and outputs for which data are available are included in the LCA model. Data gaps are filled with conservative assumptions from average data (when available) or with generic data and are documented accordingly. Only data with a contribution of less than 1 % were cut off. Ignoring such data is justified based on the irrelevance of the expected effect. Processes, materials, or emissions known to make a significant contribution to the environmental effects of the products under examination have not been neglected. All relevant data were collected comprehensively. It is assumed that the data have been completely recorded and the overall total of ignored input flows do not amount to more than 5 % of total energy and mass flows.
Environmental impacts of machines, plant and infrastructure were not included.

3.5 Background data

This study uses generic background data for the evaluation of upstream environmental impacts from *GaBi*-database 2021.1 and is modelled in *GaBi*-software version 10.

3.6 Data quality

The foreground data collected at voestalpine Wire Austria GmbH are based on the quantities used and volumes produced annually. Process data were collected by voestalpine in the course of reporting to official agencies. Data on material and energy use originate from material-specific throughput measurements of various processes as well as from controlling. The technological, geographical and time-related representativeness of the data base was kept in mind when selecting background data. Whenever specific data were missing, either generic datasets or representative average data were used instead. The implemented *GaBi* background datasets are not more than ten years old.

3.7 Period under review

Foreground data were collected in the 2018 production year, and the data are based on the volumes produced on an annual basis.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Austria

3.9 Allocation

The primary data for the upstream production of the steel billets were allocated using the partitioning approach developed by *worldsteel 2014* for calculating life cycle inventories of co-products in steel production, which is in line with the provisions of *EN 15804*. The so-called partitioning approach provides for the allocation of environmental effects on the steelmaking process and the emerging byproducts based on physical relations. Material-inherent flow properties are, thus, taken into account.

Economic allocation is not considered as referring byproducts and co-products are not directly tradable goods. Furthermore, long-term contracts for the sale of the byproducts exist, and the negotiated prices are, therefore, not subject to market dynamics.

3.10 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. The *GaBi* background database was used to calculate the LCA (*GaBi* 10; 2021.1).

4. LCA: Scenarios and additional technical information

Characteristic product properties biogenic carbon

The declared product does not contain any biogenic carbon.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in accompanying packaging	1.84	kg C

The carbon stored in the packaging was taken into account as "CO_2-neutral". Thus the storage effect of the carbon bound in the packaging is not included in the calculation but is considered as emitted immediately.

Installation into the building (A5)

The end-of-life of the packaging materials is not declared in Module A5.

Name	Value	Unit
Packaging (binding wire, packaging strips)	1.04	kg
Packaging (plastic)	0.03	kg
Packaging (cardboard)	0.0008	kg
Packaging (wood)	4.12	kg

The end-of-life scenario used in this LCA study is based on the following assumptions and thus complies with the specifications published in *ökobaudat 2022*:

End of life (C1–C4)

Name	Value	Unit
Collected separately (steel)	1000	kg
Recycling 95 %	950	kg
Landfilling 5 %	50	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Net flow of steel scrap	882	kg

This scenario contains a recycling rate of 95 %. Since voestalpine externally purchases scrap for steel production, this is offset against the steel scrap for recycling (net flow).

5. LCA: Results

The following table contains the LCA results for a declared unit of 1 tonne of prestressing steel.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction 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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 tonne prestressing steel

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Global Warming Potential total (GWP-total)	kg CO_2 eq	2.91E+03	0	3.02E+00	0	2.42E+00	-1.5E+03
Global Warming Potential fossil fuels (GWP-fossil)	kg CO_2 eq	2.9E+03	0	3E+00	0	2.44E+00	-1.49E+03
Global Warming Potential biogenic (GWP-biogenic)	kg CO_2 eq	1.65E+01	0	-3.56E-03	0	-2.5E-02	-9.68E-01
Global Warming Potential luluc (GWP-luluc)	kg CO_2 eq	1.06E+00	0	2.44E-02	0	2.44E-03	2.16E-01
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	2.18E-11	0	5.9E-16	0	5.77E-15	-2.49E-12
Acidification potential of land and water (AP)	mol H^+ eq	9.09E+00	0	9.92E-03	0	7.78E-03	-2.68E+00
Eutrophication potential aquatic freshwater (EP-freshwater)	kg P eq	1.52E-02	0	8.88E-06	0	1.86E-06	-3.06E-04
Eutrophication potential aquatic marine (EP-marine)	kg N eq	2.19E+00	0	4.55E-03	0	1.93E-03	-4E-01
Eutrophication potential terrestrial (EP-terrestrial)	mol N eq	2.33E+01	0	5.08E-02	0	2.12E-02	-3.9E+00
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	7.31E+00	0	8.94E-03	0	6.08E-03	-2.05E+00
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	4.58E-03	0	2.65E-07	0	1.68E-07	-3.25E-03
Abiotic depletion potential for fossil resources (ADPF)	MJ	2.63E+04	0	3.98E+01	0	3.56E+01	-1.3E+04
Water use (WDP)	m^3 world eq deprived	5.23E+02	0	2.77E-02	0	-2.89E-02	-2.93E+02

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 tonne prestressing steel

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier (PERE)	MJ	3.19E+03	0	2.29E+00	0	2.57E+00	1.2E+03
Renewable primary energy resources as material utilization (PERM)	MJ	6.81E+01	0	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	3.26E+03	0	2.29E+00	0	2.57E+00	1.2E+03
Non renewable primary energy as energy carrier (PENRE)	MJ	2.64E+04	0	4E+01	0	3.56E+01	-1.3E+04
Non renewable primary energy as material utilization (PENRM)	MJ	1.16E+00	0	0	0	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	2.64E+04	0	4E+01	0	3.56E+01	-1.3E+04
Use of secondary material (SM)	kg	1.17E+02	0	0	0	0	8.82E+02
Use of renewable secondary fuels (RSF)	MJ	0	0	0	0	0	0
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0	0	0	0
Use of net fresh water (FW)	m^3	1.62E+01	0	2.62E-03	0	3.67E-04	-6.59E+00

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 tonne prestressing steel

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed (HWD)	kg	3.91E-04	0	2.11E-09	0	6.3E-09	3.63E-06
Non hazardous waste disposed (NHWD)	kg	6.6E+01	0	6.27E-03	0	5.01E+01	1.56E+02
Radioactive waste disposed (RWD)	kg	1.21E-01	0	7.25E-05	0	4.05E-04	4.71E-04
Components for re-use (CRU)	kg	0	0	0	0	0	0
Materials for recycling (MFR)	kg	0	0	0	9.5E+02	0	0
Materials for energy recovery (MER)	kg	0	0	0	0	0	0
Exported electrical energy (EEE)	MJ	0	0	0	0	0	0
Exported thermal energy (EET)	MJ	0	0	0	0	0	0

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 tonne prestressing steel

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
Incidence of disease due to PM emissions (PM)	Disease incidence	ND	ND	ND	ND	ND	ND
Human exposure efficiency relative to U235 (IR)	kBq U235 eq	ND	ND	ND	ND	ND	ND
Comparative toxic unit for ecosystems (ETP-fw)	CTUe	ND	ND	ND	ND	ND	ND

Comparative toxic unit for humans (carcinogenic) (HTP-c)	CTUh	ND	ND	ND	ND	ND	ND
Comparative toxic unit for humans (noncarcinogenic) (HTP-nc)	CTUh	ND	ND	ND	ND	ND	ND
Soil quality index (SQP)	SQP	ND	ND	ND	ND	ND	ND

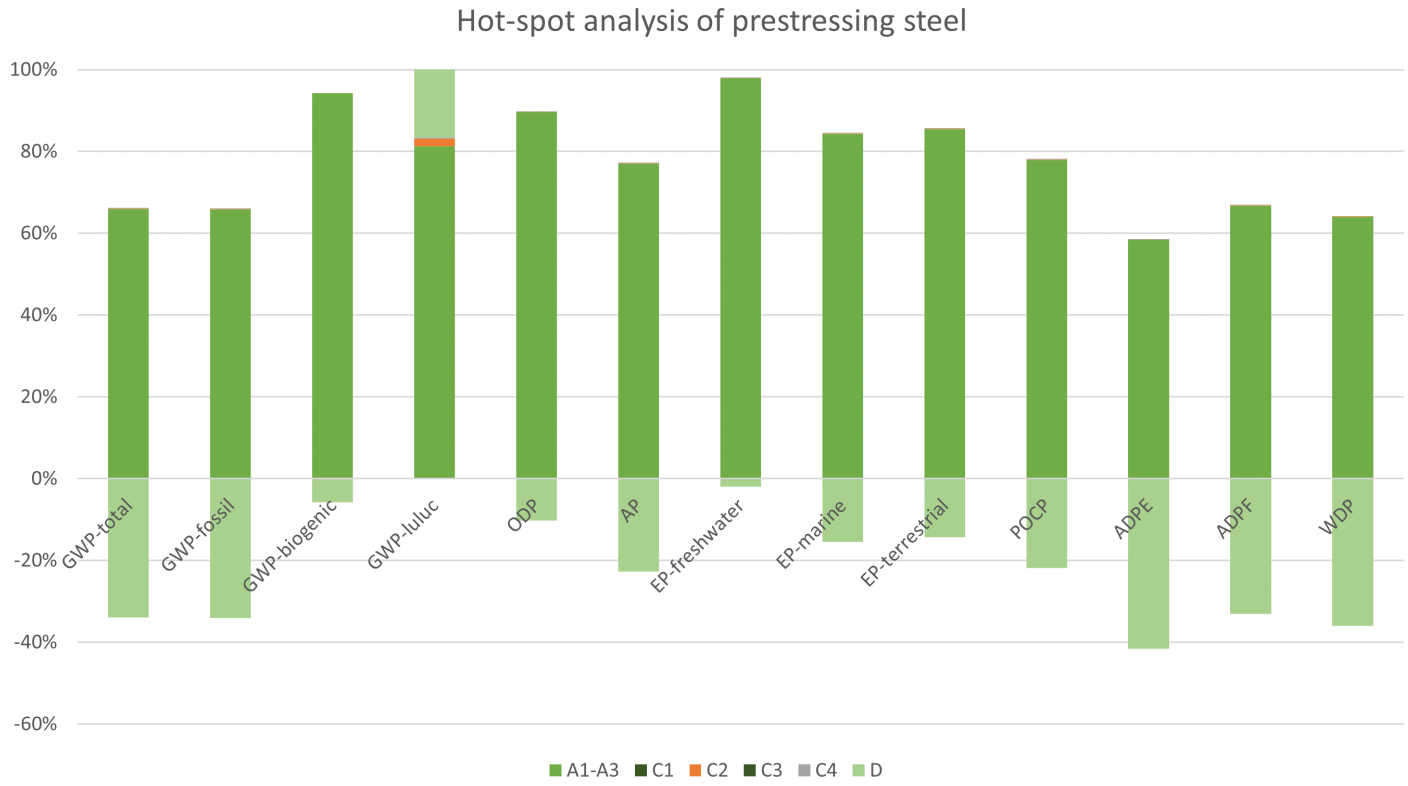
The additional and optional impact categories according to *EN 15804*+A2 are notdeclared, as the uncertainty of these indicators is to be classified as high.

Disclaimer 1 – for the indicator potential human exposure efficiency relative to U235:
This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators abiotic depletion potential for non-fossil resources, abiotic depletion potential for fossil resources, water (user) deprivation potential, deprivation weighted water consumption, eutrophication fraction of nutrients reaching freshwater end compartment, potential comparative toxic unit for humans cancerogenic, potential comparative toxic unit for humans not cancerogenic, potential soil quality index:
The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

6. LCA: Interpretation

The following interpretation contains a summary of the LCA results referenced to a declared unit of 1 tonne of prestressing steel.



A comparison of the individual lifecycle phases results in a clear dominance of the production phase (modules A1–A3). The environmental effects in the production phase are mainly dominated by the direct process emissions of billet production.

As a result of product recyclability, the material removed at the end of life can substitute primary steel. According to the set method, the first step is to saturate the secondary material used in module A with material from module C. The excess amount from module C ('net flow') can substitute primary steel and leads to corresponding substitution potentials in module D.

The environmental impact of the transport of the products to recycling (C2) as well as landfilling of the losses at the end of life (C4) represents a minor contribution to the overall environmental impact of the product.

Most of the potential environmental impacts of the production phase (module A1–A3) of the prestressing steel can be traced back to the upstream supply of the wire rod. The production of prestressing steel at the production site at Bruck contributes app. 5 % to global warming potential.

A linear correlation of the environmental impacts with the product weight is to be expected. Therefore, the conversion from the declared unit to a specific product is possible using a mass-specific scaling factor.

All primary data were specifically broken down to the declared product group. As a result, the representativity of the results for the declared product group is to be expected as high.

7. Requisite evidence

Not relevant for this EPD.

8. References

Standards

EN 15804
DIN EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

FprEN 10138-2
FprEN 10138-2:2009, Prestressing steels – Part 2: Wire.

FprEN 10138-3
FprEN 10138-3:2009, Prestressing steels – Part 3: Strand.

ISO 9001
ISO 9001:2015, Quality management systems – Requirements.

ISO 14001
ISO 14001:2015, Environmental management systems – Requirements with guidance for use.

ISO 14025
DIN EN ISO 14025:2011-10, Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

ISO 14044
DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - equirements and guidance.

ISO 50001
ISO 50001:2018, Energy Management Systems.

Further references

Candidate list
Candidate List of Substances of Very High Concern (ECHA Candidate List) of 16.01.2020, published in accordance with Article 59 (10) of the REACH Regulation Helsinki: European Chemicals Agency.

EMAS III
Regulation (EC) No 1221/2009 of the European parliament and of the council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC.

European Waste Catalogue
Guidance on classification of waste according to EWC Stat categories. Supplement to the Manual for the Implementation of the Regulation (EC) No 2150/2002 on Waste Statistics. Commission of the European Communities, EUROSTAT.

GaBi
GaBi 10, Software System and Database for Life Cycle Engineering. DB 2021.1. Sphera, 1992-2021. Available in: http://documentation.gabisoftware.com

IBU 2021
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