

Environmental Product Declaration

according to ISO 14025 and EN 15804



This declaration is for:
Prestressing steel (strand and wire)
for application in prestressed
concrete.

Provided by:
Nedri Spanstaal BV



program operator
Stichting MRPI®
publisher
Stichting MRPI®
www.mrpi.nl

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1.1.00267.2021
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17-1-2022
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17-1-2027





COMPANY INFORMATION



Groot Egtenrayseweg 13
5928 PA
Venlo
077 387 7477
info@nedri.nl
https://www.nedri.nl

PRODUCT

Prestressing steel (strand and wire) for application in prestressed concrete.

DECLARED UNIT/FUNCTIONAL UNIT

1 ton of prestressing steel (strand and wire).

DESCRIPTION OF PRODUCT

Prestressing steel with 49.68% primary steel and 51.32% secondary steel for application in prestressed concrete. The products in this EPD include PC-wire (smooth, profiled and threaded products) and PC-strand.

VISUAL PRODUCT



MRPI® REGISTRATION

1.1.00267.2021

DATE OF ISSUE

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MORE INFORMATION

<https://www.nedri.nl>

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by **Kamiel Jansen, Aveco de Bondt**.

The LCA study has been done by **Bob Roijen, SGS INTRON**.

The certificate is based on an LCA-dossier according to ISO14025 and EN15804+A2/Bepalingsmethode. It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2/Bepalingsmethode. Declaration of SVHC that are listed on the 'Candidate List of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

Stichting MRPI®
Kingsfordweg 151
1043GR
Amsterdam



ir. J-P den Hollander, Managing director MRPI®

DEMONSTRATION OF VERIFICATION

CEN standard EN15804 serves as the core PCR[a]

Independent verification of the declaration and data,

according to EN ISO 14025:2010:

internal: external: X

Third party verifier:

ing. Kamiel Jansen, Aveco de Bondt

[a] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

Prestressing steel is produced from steel wire rod. The wire rod is pickled, rinsed and pretreated for further processing. PC- wire is produced by drawing the wire rod into smaller dimensions. For some applications the PC-wires are profiled and / or threaded. PC-wire is produced on coils or cut to size. PC-strand is produced by intertwining multiple wires and rolled into coils.

Use of packaging materials	Amount per ton prestressing steel
Packaging, steel wire	1.5 kg
Packaging, softwood	2.7 kg
Packaging, PP labels	0.01 kg

The production figures (A1-3) include the use of packaging materials. The waste treatment of packaging materials is not included and should be added by the user of this EPD (if applicable).

COMPONENT (> 1%)	[kg / %]
Steel, unalloyed	100%

(*) > 1% of total mass

SCOPE AND TYPE

The production location of the prestressing steel is Venlo (NL). The end-of-life is based on the default scenario of Stichting Nationale Milieudatabase: 95% recycling 5% loss (modelled as landfill). Module D is based on the raw material equivalent of steel in NMD processendatabase. Users of the EoL scenario and module D should check this approach on topicality and representativeness for their application. The LCA calculations are made using Simapro, Ecoinvent v3.6 and NMD processendatabase v3.3. This is a company specific EPD.

PRODUCT STAGE	CONSTRUCTION					USE STAGE							END OF LIFE			BENEFITS AND
	PROCESS												STAGE			LOADS BEYOND THE
	STAGE															SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to 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	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X

X = Modules Assessed

ND = Not Declared

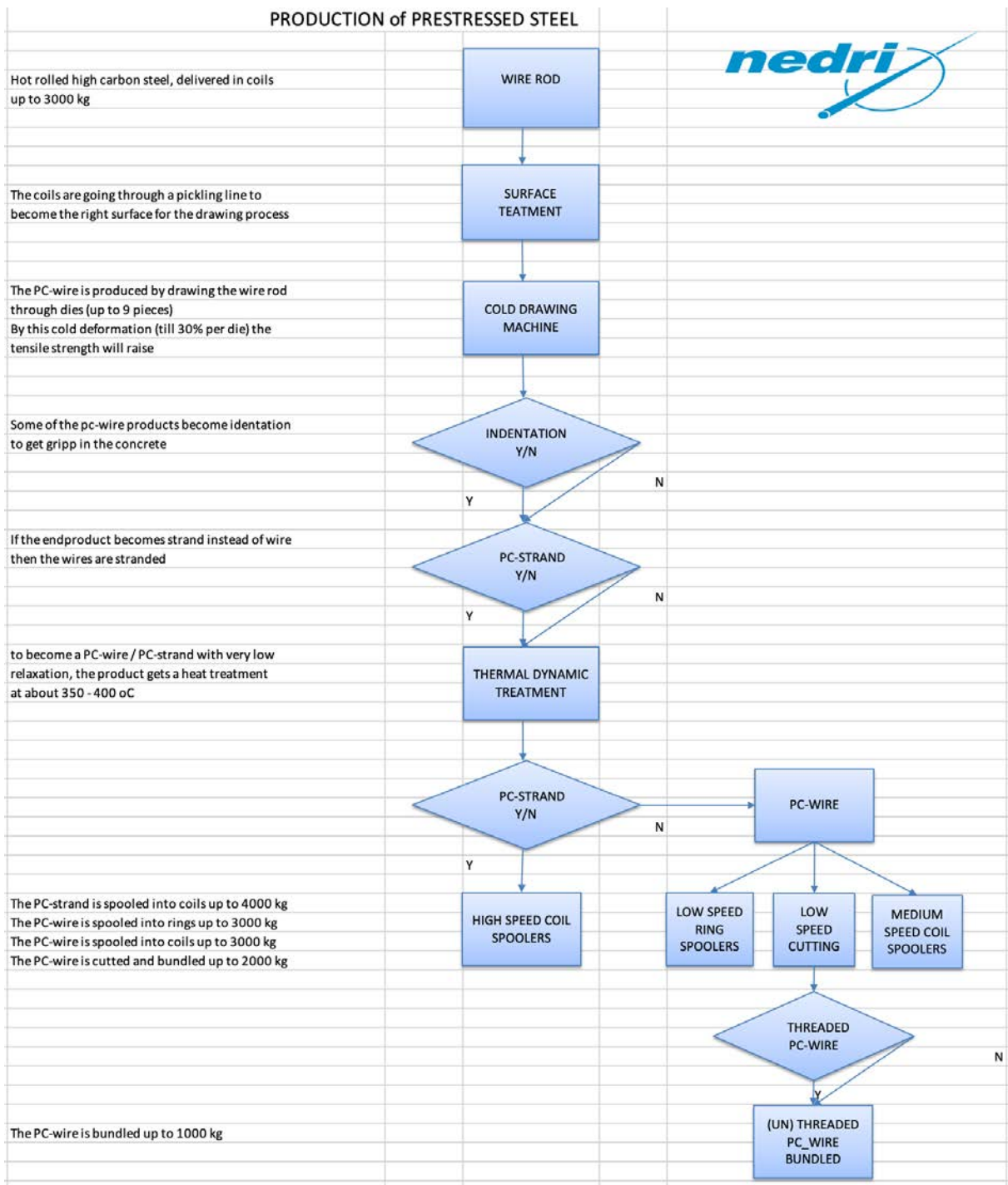


Figure: LCA process diagram according to EN 15804(7.2.1)

REPRESENTATIVENESS

This EPD is representative for PC-wire and PC-strand (smooth surfaced, profiled and threaded) produced by Nedri Spanstaal BV in Venlo.

Plastic (HDPE) coated strand is excluded from this EPD.

ENVIRONMENTAL IMPACT per functional unit or declared unit (indicators A1)

	UNIT	A1	A2	A3	A1-A3	C3	C4	D
ADPE	kg Sb eq.	9.80E-3	6.93E-4	1.27E-3	1.18E-2	1.30E-3	2.41E-6	-4.30E-4
ADPF	MJ	1.92E+4	4.71E+2	3.53E+3	2.32E+4	3.25E+2	7.36E+0	-4.44E+3
GWP	kg CO2 eq.	1.50E+3	3.17E+1	2.50E+2	1.79E+3	2.32E+1	2.58E-1	-5.94E+2
ODP	kg CFC11 eq.	9.24E-5	5.59E-6	1.88E-5	1.17E-4	2.90E-6	8.61E-8	-2.07E-5
POCP	kg ethene eq.	1.29E+0	1.90E-2	-1.45E-2	1.29E+0	2.04E-2	2.75E-4	-1.29E+0
AP	kg SO2 eq.	4.52E+0	1.59E-1	4.10E-1	5.09E+0	2.28E-1	1.89E-3	-2.01E+0
EP	kg (PO4)3- eq.	7.50E-1	3.30E-2	9.21E-2	8.75E-1	2.91E-2	3.65E-4	-2.38E-1

Toxicity indicators and ECI (Dutch market)

HTP	kg DCB-Eq	6.33E+2	1.21E+1	1.36E+1	6.59E+2	2.81E+1	1.17E-1	-3.71E+2
FAETP	kg DCB-Eq	2.12E+1	3.47E-1	8.25E+0	2.98E+1	5.23E-1	2.77E-3	4.60E+0
MAETP	kg DCB-Eq	4.01E+4	1.22E+3	5.05E+3	4.64E+4	2.28E+3	9.91E+0	3.85E+3
TETP	kg DCB-Eq	5.46E+1	4.51E-2	4.81E+0	5.95E+1	8.75E-2	2.93E-4	3.10E+1
ECI	euro	1.69E+2	3.82E+0	1.75E+1	1.91E+2	5.17E+0	3.65E-2	-7.40E+1
ADPF	kg Sb eq.	1.07E+1	2.23E-1	1.90E+0	1.29E+1	1.52E-1	3.52E-3	-3.66E+0

ADPE = Abiotic Depletion Potential for non-fossil resources
ADPF = Abiotic Depletion Potential for fossil resources
GWP = Global Warming Potential
ODP = Depletion potential of the stratospheric ozone layer
POCP = Formation potential of tropospheric ozone photochemical oxidants
AP = Acidification Potential of land and water
EP = Eutrophication Potential
HTP = Human Toxicity Potential
FAETP = Fresh water aquatic ecotoxicity potential
MAETP = Marine aquatic ecotoxicity potential
TETP = Terrestrial ecotoxicity potential
ECI = Environmental Cost Indicator
ADPF = Abiotic Depletion Potential for fossil resources expressed in [kg Sb-eq.]

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	UNIT	A1	A2	A3	A1-A3	C3	C4	D
GWP-total	kg CO2 eq.	1.55E+3	3.20E+1	2.45E+2	1.83E+3	2.21E+1	2.64E-1	-6.29E+2
GWP-fossil	kg CO2 eq.	1.55E+3	3.19E+1	2.51E+2	1.83E+3	2.34E+1	2.63E-1	-6.37E+2
GWP-biogenic	kg CO2 eq.	3.76E+0	3.07E-2	-6.16E+0	-2.38E+0	-1.34E+0	5.22E-4	6.62E+0
GWP-luluc	kg CO2 eq.	8.88E-1	2.27E-2	8.10E-1	1.72E+0	2.62E-2	7.34E-5	4.70E-1
ODP	kg CFC11 eq.	9.00E-5	6.98E-6	2.00E-5	1.17E-4	3.37E-6	1.08E-7	-1.55E-5
AP	mol H+ eq.	5.60E+0	2.15E-1	5.24E-1	6.34E+0	2.84E-1	2.50E-3	-2.46E+0
EP-freshwater	kg PO4 eq.	8.70E-2	2.96E-4	1.23E-2	9.96E-2	1.60E-3	2.95E-6	-2.25E-2
EP-marine	kg N eq.	1.20E+0	8.24E-2	1.28E-1	1.41E+0	6.27E-2	8.60E-4	-4.55E-1
EP-terrestrial	mol N eq.	1.33E+1	9.08E-1	1.46E+0	1.56E+1	7.27E-1	9.48E-3	-5.32E+0
POCP	kg NMVOC eq.	5.21E+0	2.49E-1	2.68E-1	5.73E+0	1.99E-1	2.75E-3	-3.62E+0
ADP-minerals & metals	kg Sb eq.	9.80E-3	6.93E-4	1.27E-3	1.18E-2	1.30E-3	2.41E-6	-4.30E-4
ADP-fossil	MJ, net calorific value	1.92E+4	4.71E+2	3.53E+3	2.32E+4	3.25E+2	7.36E+0	-4.44E+3
WDP	m3 world eq. deprived	5.56E+2	1.52E+0	2.48E+1	5.82E+2	3.27E+0	3.30E-1	-1.21E+2

GWP-total = Global Warming Potential total

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 Exceedence

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 Exceedence

POCP = Formation potential of tropospheric ozone photochemical oxidants

ADP-minerals&metals = Abiotic Depletion Potential for non fossil resources [2]

ADP-fossil = Abiotic Depletion for fossil resources potential [2]

WDP = Water (user) deprivation potential, deprivation-weighted water consumption [2]

Disclaimer [2]

- 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 experienced with the indicator.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	UNIT	A1	A2	A3	A1-A3	C3	C4	D
PM	Disease incidence	1.09E-4	2.36E-6	1.27E-6	1.13E-4	3.57E-6	4.85E-8	-3.68E-5
IRP	kBq U235 eq.	6.36E+1	2.08E+0	7.92E+0	7.36E+1	1.62E+0	3.02E-2	1.09E+1
ETP-fw	CTUe	3.88E+4	3.82E+2	2.24E+3	4.14E+4	1.40E+3	4.77E+0	-2.13E+4
HTP-c	CTUh	1.07E-5	1.43E-8	5.24E-7	1.12E-5	3.41E-8	1.10E-10	-8.14E-8
HTP-nc	CTUh	2.78E-4	4.19E-7	9.79E-6	2.89E-4	1.62E-6	3.39E-9	1.23E-4
SQP	---	4.58E+3	3.96E+2	1.43E+3	6.41E+3	6.54E+2	1.54E+1	-9.83E+2

PM = Potential incidence of disease due to PM emissions
 IRP = Potential Human exposure efficiency relative to U235 [1]
 ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
 HTP-c = Potential Comparative Toxic Unit for humans [2]
 HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
 SQP = Potential soil quality index [2]

Disclaimer [1]

- 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 due to 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]

- 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.

RESOURCE USE per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	C3	C4	D
PERE	MJ	1.25E+3	7.87E+0	4.02E+2	1.66E+3	5.10E+1	5.95E-2	1.29E+2
PERM	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	1.25E+3	7.87E+0	4.02E+2	1.66E+3	5.10E+1	5.95E-2	1.29E+2
PENRE	MJ	2.04E+4	5.00E+2	3.81E+3	2.47E+4	3.44E+2	7.82E+0	-4.61E+3
PENRM	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	MJ	2.04E+4	5.00E+2	3.81E+3	2.47E+4	3.44E+2	7.82E+0	-4.61E+3
SM	MJ	5.29E+2	0.00	0.00	5.29E+2	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m3	1.68E+1	6.03E-2	1.90E+0	1.88E+1	1.54E-1	7.86E-3	-2.30E+0

PERE = Use of renewable energy excluding renewable primary energy resources

PERM = Use of renewable energy resources used as raw materials

PERT = Total use of renewable primary energy resources

PENRE = Use of non-renewable primary energy resources excluding non-renewable 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 resources

SM = Use of secondary materials

RSF = Use of renewable secondary fuels

NRSF = Use of non renewable secondary fuels

FW = Use of net fresh water

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	C3	C4	D
HWD	kg	2.33E-1	1.21E-3	-7.99E-4	2.33E-1	9.80E-4	1.10E-5	-7.63E-2
NHWD	kg	4.39E+2	2.36E+1	5.78E+1	5.21E+2	9.50E+0	5.00E+1	-6.23E+1
RWD	kg	5.89E-2	3.20E-3	7.90E-3	7.00E-2	1.92E-3	4.83E-5	3.77E-3
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	7.21E+1	7.21E+1	9.50E+2	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ETE	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00

HWD = Hazardous Waste Disposed

NHWD = Non Hazardous Waste Disposed

RWD = Radioactive Waste Disposed

CRU = Components for reuse

MFR = Materials for recycling

MER = Materials for energy recovery

EEE = Exported Electrical Energy

ETE = Exported Thermal Energy

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	C3	C4	D
BCCpr	kg C	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCCpa	kg C	0.00	0.00	1.32E+0	1.32E+0	0.00	0.00	0.00

BCCpr = Biogenic carbon content in product

BCCpa = Biogenic carbon content in packaging

CALCULATION RULES

Primary data at the production locations of Nedri Spanstaal where collected in 2021 from base year 2020. The origin of the steel wire rod is based on 2021 production as Nedri Spanstaal considers this approach more representative.

No materials or processes have been excluded from the study (cut-of rule is well below 1%).

The LCA calculations are made using the Ecoinvent database v3.6. Infrastructure processes in Ecoinvent processes have been included, long term emissions in Ecoinvent processes have been excluded from the LCA calculations.

This EPD only includes the environmental data directly related to the prestressing steel. The modules: C1, C2 and the waste treatment of packaging materials depend on the application of the steel and are excluded from this study.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

Prestressing steel is produced from wire rod purchased by Nedri. Wire rod is carbon steel that has been formed into wire by means of hot rolling. Apart from carbon, this steel contains virtually no other alloying elements. In the LCA it is therefore modelled as “unalloyed steel”.

The wire rod is obtained from various European suppliers. Steel is used that is produced by the electric arc furnace (EAF) process fed with scrap and direct reduced iron. Steel is also produced using the basic oxygen furnace (BOF) process. In this LCA, the production process for the steel and further processing into wire rod is based on processes from the Ecoinvent database.

At Nedri, the wire rod is immersed in various baths to remove the mill scale from the material. This is also the pre-treatment for the following production steps. The baths are heated by means of natural gas. The wire is then drawn through various hardened steel dies until the desired diameter is reached. This process uses soap as a lubricant. In this process, electricity is used to drive the electric motors that pull the wire through the dies.

Indented pc wire is then profiled. Before customizing the pc wire / pc strand, it becomes a heat treatment where as the product becomes its very low relaxation. This is followed by the processes in which the different product types are manufactured, such as twisting wires into a strand, applying threads and coiling.

The products are then packed by means of a steel strap. In addition, the products are provided with a plastic label. Wooden beams are also used to place underneath and between the products.”



DECLARATION OF SVHC

No substances that are listed in the latest “Candidate List of Substances of Very High Concern for authorisation” are included in the product that exceeds the limit for registration.



REFERENCES

Stichting nationale Milieudatabase, Bepalingsmethode Milieuprestatie Bouwwerken versie 1.0.

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

ISO, ISO 14025:2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures, 2006.

SGS INTRON report: A125760/R20210326, 16 december 2021



REMARKS

None