

## D&D Wire Industrial and Trading Co. Ltd.



## ENVIRONMENTAL PRODUCT DECLARATION

**PRODUCT NAME:** Stabilized wires  
and strands for prestressing of  
concretes

**PLANTS:** Hungary, H-3527 Miskolc,  
Sajószigeti street 4

**in compliance with ISO 14025 and EN 15804:2012+A1:2013**

Program Operator	EPDIItaly
Publisher	EPDIItaly

Declaration Number	<i>EPD-DD-001-20</i>
Registration Number	<i>EPDITALY0087</i>
ECO EPD Registration Number	<i>00001184</i>

Issue Date	<i>25 / 02 / 2020</i>
Valid to	<i>25 / 02 / 2025</i>



## General information

EPD owner	<p>D&amp;D Wire Industrial and Trading Co. Ltd</p>  <p><a href="http://www.drotaru.hu/">http://www.drotaru.hu/</a></p>
Address of the company	3527 Miskolc, Sajószigeti street 4., Hungary
Company contact	<p>Zoltán Lehóczki</p> <p>Tel: +36 30 437 2327</p> <p><a href="mailto:zoltan.lehoczki@drotaru.hu">zoltan.lehoczki@drotaru.hu</a></p>
Name of the product	Stabilized wires and strands for prestressing of concretes
Applied standards	<p>ISO 14040-44 – Life cycle assessment</p> <p>ISO 14025 - Environmental labels and declarations - Type III environmental declarations - Principles and procedures</p>
The PCR was conducted by	<p>ICMQ-001/15 rev 2.1</p> <p>EPDItaly</p> <p>Via G. De Castillia, 10 20124 Milan, Italy</p> <p><a href="http://www.epditaly.com">www.epditaly.com</a></p>
Reference EPD system	Regulation of the EPDItaly Programme – rev.4.0 (03/06/2019)
Program Operator & Publisher	<p>EPDItaly</p> <p>Via G. De Castillia, 10 20124 Milan, Italy</p>  <p><a href="http://www.epditaly.com">www.epditaly.com</a></p>
LCA was performed by	<p>Bay Zoltán Nonprofit Ltd. for Applied Research</p>  <p><a href="http://www.bayzoltan.hu/en/home/">http://www.bayzoltan.hu/en/home/</a></p>

Independent verifier	<p>internal / X <u>external</u></p> <p>ICMQ</p> <p>Via Gaetano De Castillia, 10 - 20124 Milano, Italy</p>  <p><a href="https://www.icmq.it/">https://www.icmq.it/</a></p> <p>Accredited by ACCREDIA</p>
<u>Declared</u> /Functional unit	1kg steel wire, strand at the factory gate
Comparability	EPD of these construction products may not be comparable if because they do not comply with EN 15804:2012 + A1:2013. (EPD within the same product category from different programs may not be comparable.).
Management system	ISO 9001, ISO 14001

## Company information

### Description of the organisation:

D&D” Wire Industrial and Trading Co. Ltd. is the only plant in Hungary specialized in the manufacture of pre-stressing concrete strands. The product is transported to several European countries and more than 84 % of the total amount of our products leaves the country. The user of our products is the building industry, typically plants engaged in manufacturing pre-fabricated pre-stressed concrete elements. The target of the company markets of strategic importance include Benelux countries, Poland, the Czech Republic and Hungary, which together represent 72 % of clientele. D&D carries out its activity on its single premises in Miskolc and the theoretical capacity of the available machinery is approximately 80,000 tons of finished products per year. D&D manufactures products almost exclusively from basic materials produced by its parent company (Třinecké Železářny, a.s.) and marketed by Moravia Steel, a.s., typically from high strength wire rods. The quality of the basic materials and products is guaranteed by continuous testing and controls carried out both in D&D’s laboratory and the accredited laboratories of consumer countries.

## Scope and Type of EPD

Product name: high tensile steel wires and strands, which are used for the prestressing of concrete and other tensile applications in the construction field

Product description: High strength pre-stressing steel products. These products are typically incorporated into pre-stressed structural elements including perforated ceiling panels, bridge beams, railroad ties and piles. As a result of the adhesion between pre-stressing steels and the hardened concrete, D&D obtain a pre-stressed concrete structure with excellent load bearing properties. In addition to pre-stressing, pro-tensioning technology is becoming increasingly common, whose application facilitates spanning broader spaces with increased load bearing capacity.

UN CPC code: 41 UNSTATS

Geographical scope: Hungary

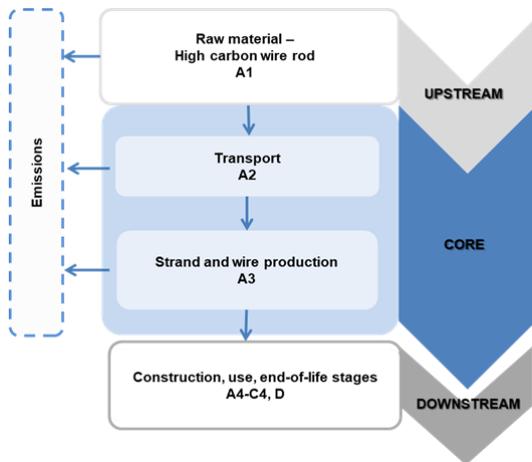
Location of the production is in Northern Hungary (Észak-Magyarország) – NUTS code: HU311

Table of Modules, illustrating the Type of EPD with respect to the modules considered, e.g. cradle to gate with options.

Time representativeness: 2018

Database(s) and LCA software used: GaBi Profession 9 software thinkstep (version 9.2, 2019) with Professional database

System diagram:



Description of system boundaries: cradle-to-gate

Product stage			Construction process stage		Use stage							End-of-life stage				Resource recovery stage
Raw materials	Transport	Manufacturing	Transport	Construction installation	Use stage	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

When a module is accounted for the box in the last row is then marked with an “X”.

§ When a module is not accounted for the box in the last row is then marked with “MND”, not declared.

Excluded lifecycle stages: The downstream modul – all processes (construction, use, end-of-life) which are following the manufacturing stage (A3) – were not considered, in accordance with the EN15804.

## Detailed product description

### Product

In 2018, D&D manufactured the following products:

- ◆ **High strength pre-stressing steel products:** Pre-stressing concrete strand, Pre-stressing concrete wire, stabilized wire, Cold drawn wire.

These products are typically incorporated into pre-stressed structural elements including perforated ceiling panels, bridge beams, railroad ties and piles. As a result of the adhesion between pre-stressing steels and the hardened concrete, D&D obtain a pre-stressed concrete structure with excellent load bearing properties. In addition to pre-stressing, pretensioning technology is becoming increasingly common, whose application facilitates spanning broader spaces with increased load bearing capacity.

◆ **Low strength steel products:** steel fibre

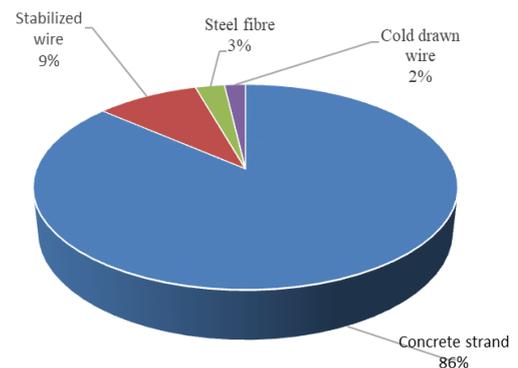
These products are used in applications where high energy absorption capacity and durability of the concrete are required. These products are successfully used worldwide in industrial floors, tunnels, concrete pipes, earthquake-resistant structures as well as in cast concretes and shotcretes. The Company ceased production of steel fibres as of 1 July 2019.



**The products of the D&D Wire Industrial and Trading Co. Ltd**

**In 2018 D&D had four largest customers:**

- Feron a.s. (Czech Republic): 8,995 tons
- Ferrobeton (Hungary): 4,016 tons
- De Vries International (the Netherlands): 3,732 tons
- Pekabex (Poland) 3,170 tons



**Distribution of our sales among different products groups in 2018**

**Production**

In 2018 D&D manufactured 62,496 tons of finished products. The production efficiency are measured by an indicator showing the quantity of finished products manufactured in one working hour

The high strength wires and strands made from unalloyed steel wire rod. The typical chemical composition is the following:

Materials / chemical substances	Unit (%)
Iron (Fe)	98,0
Carbon (C)	0,84
Silicon (Si)	0,23
Manganese (Mn)	0,68
Phosphorus (P)	0,01
Sulphur (S)	0,01
Chromium (Cr)	0,1
Nickel (Ni)	0,03
Molybdenum (Mo)	0,008
Copper (Cu)	0,04
Aluminium (Al)	0,002
Vanadium (V)	0,004
Nitrogen (N)	0,003

Cold deformation (in case of our products called drawing) is applied for reduction the diameter of the wire rod to reach the final diameter.

In case of prestressing wires, the wire is thermo-mechanically treated (called stabilization) to reduce the production

stresses in the steel and to reach better relaxation value. The stabilization is a tempering in 360-390°C combined with a mechanical stressing with a 40-50% of the tensile strength. For the customers' request we make indentation to the wire's surface to achieve better anchorage in the concrete.

In case of prestressing strands, after drawing the wires are stranded together. To reduce the production stresses in the steel and to reach better relaxation value, the strands are also thermo-mechanically treated (stabilization) like the wires. The strands consist of 2 or 3 or 7 wires. In case of 2 and 3 wire strands, the wires are spun together in a theoretical axis. In case of 7 wire strand, six wires spun in spiral form to a core wire having larger diameter by >3%. The larger core wire diameter takes "opened" the strand which is an advantage at the anchorage in the concrete, while the outer wires clamp the central wire.

### Packaging

#### Distribution packaging:

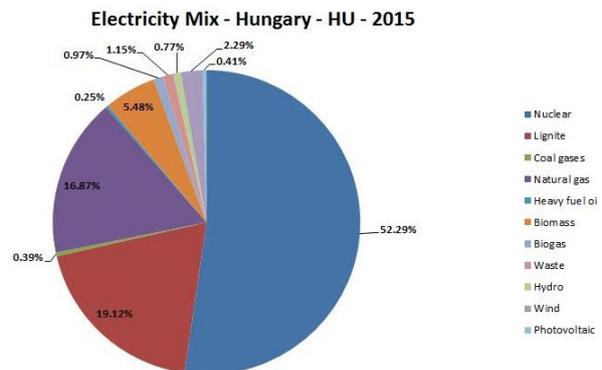
Packaging is made according to the request of the client. Possible options are:

- steel bend,
- wrapped in PP foil,
- wrapped in PP textile,
- on wood legs.

The coils are fixed with steel straps. Coils are "eye to sky", fixed to 2 wood legs.

### Electricity grid mix

The role of the used electricity is important for the A3 production stages. The national specific electricity consumption mix is provided by the conversion of the different energy carriers to electricity and imports from neighbouring countries. The composition of the Hungarian grid mix is described in the next figure. Its GWP factor is 0,442 CO<sub>2</sub>e/kWh.



**Contribution of different energy carriers into the Hungarian electricity grid mix**

Functional unit / declared unit: 1kg of steel wire and strand products

Additional information: Concerning **cut-off rules** the PCR requirements have been considered: minimum 95% of all flows (mass and energy) of the core processes has to be included. In our specific case, input materials of the production process (A3) with very small amounts (<1%) are not included.

Data used in module A3 are supplied by the manufacturer and consist of energy consumption, recorded amount of material for the product, quantity of waste, air- and water emissions.

The data used in module A1 refers to the average EU steel wire rod production dataset generated by Worldsteel and available in the GaBi thinkstep database. This Worldsteel model was updated with 2017 data and the data set is valid until 2023.

A2 module describes the external transport, using an average European railway transportation model of the GaBi database, customized to the specific distance.

From the D&D Wire Industrial and Trading Co. Ltd production, the recyclable part (ferrous metal, iron and steel) of the waste is 1,94% of the input product material flow.

At the selection of the most suitable process it is important to apply the local – country specific – process. Therefore the county specific processes were chosen for example in case of the electricity, natural gas, etc., but other cases – when there were not typical country specific process available – average European processes were selected.

Generic data used in the LCA study are not older than 5 years and site specific data are not older than 2 years.

Allocation: In the reference year, D&D produced a co-product, steel fibre, in minor quantities (~3%). Where it was not possible to avoid, allocation was carried out based on the mass of treated materials.

## Environmental performance

Beside the total A modul results, parameters are declared also separately for A1, A2 and A3. As A1 modul (based on the EU average Worldsteel data) has very significant contributions, the aim is to declare transparent values for each sub-modul even if they have less significant contributions to the total A results

### LCA results – Environmental impact per functional or declared unit

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3
<i>Global warming potential (GWP)</i>	<i>kg CO<sub>2</sub> eq.</i>	<i>2,33E+00</i>	<i>4,91E-03</i>	<i>1,94E-01</i>	<i>2,53E+00</i>
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	2,57E-15	1,38E-16	1,47E-15	4,17E-15
Acidification potential (AP)	kg SO <sub>2</sub> eq.	6,91E-03	1,27E-05	7,96E-04	7,72E-03
Eutrophication potential (EP)	kg PO <sub>4</sub> <sup>3-</sup> eq.	5,35E-04	1,26E-06	7,99E-05	6,16E-04
Formation potential of tropospheric ozone (POCP)	kg C <sub>2</sub> H <sub>4</sub> eq.	7,23E-04	8,86E-07	5,37E-05	7,77E-04
Abiotic depletion potential – Elements (ADPE)	kg Sb eq.	3,95E-07	1,45E-09	3,06E-08	4,13E-07
Abiotic depletion potential – Fossil resources (ADPF)	MJ, net calorific value	2,49E+01	5,28E-02	2,27E+00	2,72E+01

**Caption:** GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources

### LCA results – Resource use per functional or declared unit

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	
Primary energy resources – Renewable	Used as energy carrier (PERE)	MJ, net calorific value	9,32E-01	3,58E-02	6,88E-01	1,66E+00
	Used as raw materials (PERM)	MJ, net calorific value	0,00E+00	0,00E+00	0,04561	4,56E-02
	TOTAL (PERT)	MJ, net calorific value	9,32E-01	3,58E-02	6,88E-01	1,66E+00
Primary energy resources – Non-renewable	Use as energy carrier (PENRE)	MJ, net calorific value	2,52E+01	8,89E-02	4,19E+00	2,95E+01
	Used as raw materials (PENRM)	MJ, net calorific value	0,00E+00	0,00E+00	0,1032	1,03E-01
	TOTAL (PENRT)	MJ, net calorific value	2,52E+01	8,89E-02	4,19E+00	2,95E+01
Secondary material	kg	3,00E-01	0,00E+00	0,00E+00	3,00E-01	
Renewable secondary fuels	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
Non-renewable secondary fuels	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
Net use of fresh water (FW)	m <sup>3</sup>	7,05E-02	4,22E-05	1,57E-03	7,21E-02	

**Caption:** 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;

<sup>1</sup> Wooden content of packaging legs material is considered with 19,2 MJ/kg energy content

<sup>2</sup> Energy content of PP (polypropylene) packaging is considered with 47,3 MJ/kg

PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

## LCA results – Output flows and waste categories per functional or declared unit

### Waste production and output flows

#### Waste production

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3
Hazardous waste disposed (HWD)	kg	1,91E-06	4,25E-11	5,61E-09	1,92E-06
Non-hazardous waste disposed (NHWD)	kg	2,06E-01	6,47E-05	6,95E-03	2,13E-01
Radioactive waste disposed (RWD)	kg	5,81E-07	1,43E-05	7,54E-04	7,69E-04

#### Output flows

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3
Components for reuse (CRU)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling (MFR)	kg	0,00E+00	0,00E+00	1,87E-02	1,87E-02
Materials for energy recovery (MER)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity (EEE)	MJ	0,00E+00	0,00E+00	2,00E-03	2,00E-03
Exported energy, thermal (EET)	MJ	0,00E+00	0,00E+00	2,19E-05	2,19E-05

**Caption:** HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

At most of the declared parameters the A1 module is the most significant life cycle phase. This includes the production of steel wire rod and has a very significant contribution to the inventory and impact assessment results (56%-97%).

The A2 module, the transportation of steel wire rod by train, is not a significant issue.

The A3 module is a significant issue ( $\geq 10\%$ ) according to the following results: PERT (41%), PENRT (14%), ODP (35%), AP (10%), EP (13%). These potential impacts are related mostly to the production of electricity consumed from the Hungarian grid (especially for drawing, stranding and surface treatment). There are no any other processes within the A3 model having 5% contribution.

The production process of the strand and wire are divided in the stranding process where the values were measured separately (amount of wire and strand, electricity and water demand). The differences of the environmental impacts of these products are not much than 10% therefore there is no need to analysed separately.

The LCA study is complete; there are no relevant life cycle phases or processes excluded.

Consistency of the used data is good: high quality specific data have been collected for the A3 module, while the best available generic data have been selected for A1 and for all other life cycle processes.

Sensitivity check would be useful concerning the representativeness of the steel wire rod dataset provided by Worldsteel. Such analysis is not possible because of the lack of background information. At the moment we can presume that the final LCA results are very sensitive for the usage of the average EU Worldsteel dataset but currently these are the best available data to describe the A1 life cycle phase. For transparency reasons A1, A2 and A3 results have been declared separately.

## Additional information

D&D Wire Industrial and Trading Co. Ltd. makes efforts to achieve continuous quality improvement and environmentally conscious behaviour in the interest of its own effectiveness and to live up to the expectations of the owners and customers and to maintain employees' quality of life and to keep them healthy.

The company intends to improve environmental parameters, prevent contaminations, keep the premises tidy, organize selective waste collection and dispose our wastes properly. D&D also aims to become an organization that consumes natural resources sparingly and to function in an energy-conscious manner. During regular internal trainings the company educates employees in this direction.

D&D maintains ISO 9001:2015 Quality Management System, ISO 14001:2015 Environmental Management System and ISO 50001:2011 Energy Management System.

## References

PCR: ICMQ-001/15 rev 2.1. 2019.06.03 - EPDIItaly

Reference EPD system: Regulation of the EPDIItaly Programme – rev.4.0 (03/06/2019)

The underlying LCA of the current EPD: LCA of the products of D&D Wire Industrial and Trading Co. Ltd for EPD (Environmental Products Declaration) - February 2020