Environmental Product Declaration Type III ITB No. 672/2024

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PC wire and strand with low relaxation (Hlohovec)

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ITB is a verified member of The European Platform for EPD program operators and LCA practitioners www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A4, C1-C4 and D modules in accordance with EN 15804+A2
(Cradle to Gate with options)

The year of EPD validation: 2024

Service Life: 50 years

PCR: ITB-PCR A (PCR v 1.6. based on EN 15804+A2)

Declared unit: 1 kg

Product Standards: EN 10138-2, EN 10138-3, BS5896

Reasons for performing LCA: B2B

Representativeness: manufactured in Slovakia

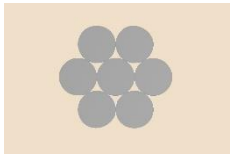
PRODUCT DESCRIPTION

Bekaert (www.bekaert.com) is a global technological and market leader in advanced solutions based on metal transformation, and the world's largest independent manufacturer of drawn steel wire products. This EPD covers products: **PC wire** - Low relaxation pre-stressing wire Ø4-8mm, **PC strand** - Low relaxation 7wire pre-stressing strand Ø9-18.2mm and **Monostrand** - Low relaxation 7wire pre-stressing strand Ø9-18.2mm, greased & HDPE sheathed produced by Bekaert in manufacturing plant in Hlohovec, Slovakia. For sheathed products the inner grease filling has been specifically designed, and features high mechanical stability, while offering additional corrosion protection . The final coating, HDPE sheath, consists of PE extruded around the strand. The standard wall thickness of the sheath is 1.5mm (-0.0/+0.5mm), though different sizes can be produced upon request.

Bekaert PC wires and strands fully comply with latest standards and best manufacturing practices.

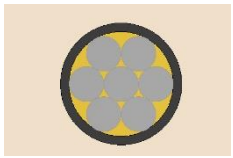
Application

Our pre-stressing wire can be used in prestressed concrete elements such as railway sleepers, pre-cast beams, concrete masts, etc..



Application

Our main applications include masts, beams, prestressed concrete slabs, LNG tanks, water reservoirs, ground anchors, windmills, and bridges.



Application

Our advanced strands are ideal for demanding applications that require exceptional ductility, such as nuclear power plants, external PT tendons for highly corrosive environments, and other high-end uses.

More specific product technical data is available at Bekaert.com.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 kg of: PC Wire (1), PC Strand (2) and HDPE sheathed Strand (3).

System boundary

This EPD is based on a cradle-to-gate with options LCA and covers all the life cycle modules A1-A3, A4-A5, C1-C4, and D, in which 100 weight -% of the product has been accounted in accordance with EN 15804+A2 and ITB PCR. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculation. It can be assumed that the total sum of omitted processes does not exceed 2% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of products is a line process in a manufacturing plant located at Hlohovec, Slovakia. Allocation of impacts is done on product mass basis. All impacts from raw materials production (wire rod, grease, HDPE, wood packaging, paper, foil and pallets) are allocated in A1 module of the LCA. 99% of the impacts from a line production were allocated to product covered by this declaration. Module A2 includes transport of raw materials such as steel and HDPE from supplier to manufacturing plant. Municipal wastes of the factory were allocated to module A3. Energy supply and electricity was inventoried and 100% was allocated to the product assessed.

System limits

Minimum 99% materials and 100% energy consumption (grid electricity, gas, LPG) were inventoried in the factory and were included in the calculation. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation (main input is steel Wire Rod and HDPE), utilized thermal energy, and electric power consumption, direct production waste, and available emission measurements. Tires consumption for transport was not taken into account. Pre components like labels, tapes, minor chemicals with a percentage share of less than 0.1% were not included in the calculations. It is assumed that the total sum of omitted processes does not exceed 1% of all impact categories. In accordance with EN 15804+A2 machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

A1 and A2 Modules: Raw materials supply and transport

The steel input materials are declared to be produced primarily in BOF. Data on transport of the different input products to the manufacturing plants were inventoried in detail and modelled by the assessor. For calculation purposes European fuel averages are applied in module A2.

A3: Production

All process operations such as wire drawing, galvanization, stranding, extrusion and packaging are carried out in manufacturing plant. The production process options (Hlohovec, Slovakia) is:

PC wire:
Batch pickling → drawing → stress-relieving → packing

PC strand:
Batch pickling → drawing → stranding → stress-relieving → rewinding → packingHDPE sheathed strand:
Batch pickling → drawing → stranding → stress-relieving → extrusion → rewinding → packing
The main input for PC wire is steel and for HDPE sheathed strands steel (approx. 89%), grease (1%) and HDPE (9%). Packaging is either wooden drums), or reel less coils on a palette .

A4: Transport to construction site

The following transport scenario to the place of use was assumed based on the manufacturer's declaration: large vehicle, 75% capacity over an average distance of 500 km. For calculation purposes, European fuel averages are applied in module A4.

C and D modules: End of life scenarios

The manufacturer declares the technology and the scenario in which the wires and strands can be easly recovered form object in demolition process. 98% of recovered steel can be used for new steel production (EAF process). 100% of HDPE (for sheathed products) is designated to incineration plant, therefore, the profit is added in the replacement of gas fuel (HDPE calority is adopted at 40 MJ / kg). It is assumed that at the end of life the transport distance from the product deconstruction place to waste processing (C2) is 50 km on > 16 t loaded lorry with 75% capacity utilization and fuel consumption of 35 l per 100 km. The reuse, recovery and recycling potential for a new product system is considered beyond the system boundaries (module D) based on World Steel recommendations and national practice (see references).

Table 1. End of life scenarios for PC strands products

Progress products	Material recovery	Reuse	Recycling	Landfilling
Steel products	98%	0%	100% (EAF)	0%
HDPE	75%	0%	50% (incineration)	50%

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2023– 31.12.2023 (1 year). The life cycle assessments were done for Slovakia as reference area.

Data quality - production

The values determined to calculate A3 originate from verified Progress LCI inventory data. A1 values were prepared considering European made steel products based on Ecoinvent. Allocation for steel production impacts is done in accordance with LCI data for Steel products Report compiled by Brayan Hughes and William Hare (2012 for World Steel Association).

Assumptions and estimates

The impacts of the representative products were aggregated using weighted average. Data regarding production per 1 kg of product was averaged for the analyzed production of product group.

Calculation rules

LCA was done in accordance with ITB PCR A document.

Databases

The background data for the processes come from the following databases: Ecoinvent v.10 (steel, grease, ancillary items, packaging), Plastic Europe (HDPE), specific production data (Bekaert), energy data (Ecoinvent, ZSE, Slovenské elektrárne, Messer, Slovak electricity mix and combustion factors for fuels). Carbon emission factor for Slovak electricity used for LCA is 0,199 kg eq CO_2/kWh. Specific (LCI) data quality analysis was a part of the audit. The time related quality of the data used is valid (5 years).

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to the unit DU– 1 kg of: (1) PC wire, (2) PC strand, (3) HDPE sheathed strand. The following life cycle modules are included in the declaration (Table 2).

Table 2. System boundaries (life stage modules included) in a product environmental assessment

Environmental assessment information (MA – Module assessed, MNA – Module not assessed, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	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**
MA	**MA**	**MA**	**MA**	**MNA**	**MNA**	**MNA**	**MNA**	**MNA**	**MNA**	**MNA**	**MNA**	**MA**	**MA**	**MA**	**MA**	**MA**

Table 3. Life cycle assessment (LCA) results for specific product - PC wire – environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO_2	2.05E+00	4.45E-02	1.20E-01	2.22E+00	8.34E-02	2.64E-03	8.34E-03	6.39E-02	1.06E-04	-1.39E+00
Greenhouse potential - fossil	eq. kg CO_2	2.56E+00	4.43E-02	1.16E-01	2.72E+00	8.31E-02	2.64E-03	8.31E-03	6.38E-02	1.05E-04	-1.40E+00
Greenhouse potential - biogenic	eq. kg CO_2	2.12E-02	1.51E-04	2.55E-03	2.39E-02	2.84E-04	1.00E-04	2.84E-05	1.33E-05	2.68E-07	4.24E-03
Global warming potential - land use and land use change	eq. kg CO_2	1.67E-03	1.74E-05	1.25E-03	2.93E-03	3.26E-05	1.20E-06	3.26E-06	1.01E-05	9.94E-08	-1.30E-04
Stratospheric ozone depletion potential	eq. kg CFC 11	1.22E-07	1.03E-08	1.18E-08	1.44E-07	1.92E-08	7.00E-11	1.92E-09	7.80E-01	4.26E-11	-5.06E-08
Soil and water acidification potential	eq. mol H+	1.11E-02	1.80E-04	9.26E-04	1.22E-02	3.37E-04	3.80E-05	3.37E-05	5.32E-04	9.90E-07	-5.54E-03
Eutrophication potential - freshwater	eq. kg P	1.30E-03	2.98E-06	9.51E-05	1.40E-03	5.59E-06	6.50E-06	5.59E-07	4.32E-07	9.81E-09	-6.03E-04
Eutrophication potential - seawater	eq. kg N	2.39E-03	5.43E-05	1.29E-04	2.57E-03	1.02E-04	5.50E-06	1.02E-05	1.81E-03	3.45E-07	-1.22E-03
Eutrophication potential - terrestrial	eq. mol N	2.52E-02	5.92E-04	9.41E-04	2.68E-02	1.11E-03	4.65E-05	1.11E-04	3.42E-03	3.77E-06	-1.32E-02
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.05E-02	1.81E-04	3.72E-04	1.11E-02	3.40E-04	1.30E-05	3.40E-05	7.46E-04	1.10E-06	-6.96E-03
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	3.58E-05	1.57E-07	9.30E-08	3.60E-05	2.95E-07	1.67E-08	2.95E-08	1.45E-08	2.42E-10	-2.55E-05
Abiotic depletion potential - fossil fuels	MJ	2.81E+01	6.57E-01	6.28E+00	3.50E+01	1.23E+00	5.80E-02	1.23E-01	6.05E-02	2.89E-03	-1.17E+01
Water deprivation potential	eq. m^3	8.62E-01	3.04E-03	5.99E-02	9.25E-01	5.70E-03	1.20E-03	5.70E-04	1.42E-03	9.16E-06	-2.19E-01

Table 4. Life cycle assessment (LCA) results for specific product -PC wire– additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1-A4	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA

Table 5. Life cycle assessment (LCA) results for specific product - PC wire - the resource use (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.22E+00	9.43E-03	4.87E-01	3.71E+00	1.77E-02	4.30E-03	1.77E-03	1.11E-03	2.51E-05	-9.72E-01
Consumption of renewable primary energy resources used as raw materials	MJ	1.00E-01	0.00E+00	0.00E+00	1.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.32E+00	9.43E-03	4.90E-01	3.82E+00	1.77E-02	4.30E-03	1.77E-03	1.11E-03	2.51E-05	-9.72E-01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.98E+01	6.57E-01	5.71E+00	3.62E+01	1.23E+00	5.82E-02	1.23E-01	-2.95E+00	2.89E-03	0.00E+00
Consumption of non-renewable primary energy resources used as raw materials	MJ	6.60E-03	0.00E+00	0.00E+00	6.60E-03	0.00E+00	0.00E+00	0.00E+00	3.01E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	2.98E+01	6.57E-01	6.33E+00	3.68E+01	1.23E+00	5.82E-02	1.23E-01	6.06E-02	2.89E-03	-1.13E+01
Consumption of secondary materials	kg	9.44E-02	2.20E-04	3.19E-04	9.49E-02	4.14E-04	5.30E-06	4.14E-05	2.74E-05	6.07E-07	-1.49E-01
Consumption of renew. secondary fuels	MJ	3.37E-03	2.43E-06	7.71E-07	3.38E-03	4.56E-06	2.95E-08	4.56E-07	3.72E-07	1.59E-08	-2.34E-04
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m^3	6.13E-03	8.27E-05	6.97E-03	1.32E-02	1.55E-04	1.58E-05	1.55E-05	5.36E-05	3.16E-06	-9.87E-03

Table 6 Life cycle assessment (LCA) results for specific product - PC wire– waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	2.23E-04	7.38E-04	5.90E-03	6.87E-03	1.38E-03	3.67E-05	1.03E-04	6.92E-05	3.07E-06	-1.39E-04
Non-hazardous waste	kg	1.28E+00	1.31E-02	4.69E-02	1.34E+00	2.46E-02	2.48E-02	1.83E-03	1.23E-03	4.32E-05	1.81E-01
Radioactive waste	kg	8.55E-05	4.91E-08	1.64E-05	1.02E-04	9.21E-08	7.70E-08	6.86E-09	4.60E-09	1.92E-08	1.98E-05
Components for re-use	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	0.00E+00	0.00E+00
Materials for recycling	kg	4.90E-07	2.04E-06	1.80E-01	1.80E-01	3.82E-06	7.40E-08	2.84E-07	1.91E-07	5.78E-09	0.00E+00
Materials for energy recovery	kg	2.13E-09	1.65E-08	3.18E-08	5.04E-08	3.09E-08	3.01E-10	2.30E-09	1.54E-09	6.85E-11	0.00E+00
Exported Energy	MJ	6.15E-05	0.00E+00	6.11E-04	6.72E-04	0.00E+00	5.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 7. Life cycle assessment (LCA) results for specific product -PC strand– environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO_2	2.05E+00	4.45E-02	1.32E-01	2.23E+00	8.34E-02	2.64E-03	8.34E-03	6.39E-02	1.06E-04	-1,39E+00
Greenhouse potential - fossil	eq. kg CO_2	2.56E+00	4.43E-02	1.16E-01	2.72E+00	8.31E-02	2.64E-03	8.31E-03	6.38E-02	1.05E-04	-1,40E+00
Greenhouse potential - biogenic	eq. kg CO_2	2.12E-02	1.51E-04	2.55E-03	2.39E-02	2.84E-04	1.00E-04	2.84E-05	1.33E-05	2.68E-07	4,24E-03
Global warming potential - land use and land use change	eq. kg CO_2	1.67E-03	1.74E-05	1.25E-03	2.93E-03	3.26E-05	1.20E-06	3.26E-06	1.01E-05	9.94E-08	-1,30E-04
Stratospheric ozone depletion potential	eq. kg CFC 11	1.22E-07	1.03E-08	1.18E-08	1.44E-07	1.92E-08	7.00E-11	1.92E-09	7.80E-01	4.26E-11	-5,06E-08
Soil and water acidification potential	eq. mol H+	1.11E-02	1.80E-04	9.26E-04	1.22E-02	3.37E-04	3.80E-05	3.37E-05	5.32E-04	9.90E-07	-5,54E-03
Eutrophication potential - freshwater	eq. kg P	1.30E-03	2.98E-06	9.51E-05	1.40E-03	5.59E-06	6.50E-06	5.59E-07	4.32E-07	9.81E-09	-6,03E-04
Eutrophication potential - seawater	eq. kg N	2.39E-03	5.43E-05	1.29E-04	2.57E-03	1.02E-04	5.50E-06	1.02E-05	1.81E-03	3.45E-07	-1,22E-03
Eutrophication potential - terrestrial	eq. mol N	2.52E-02	5.92E-04	9.41E-04	2.68E-02	1.11E-03	4.65E-05	1.11E-04	3.42E-03	3.77E-06	-1,32E-02
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.05E-02	1.81E-04	3.72E-04	1.11E-02	3.40E-04	1.30E-05	3.40E-05	7.46E-04	1.10E-06	-6,96E-03
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	3.58E-05	1.57E-07	9.30E-08	3.60E-05	2.95E-07	1.67E-08	2.95E-08	1.45E-08	2.42E-10	-2,55E-05
Abiotic depletion potential - fossil fuels	MJ	2.81E+01	6.57E-01	6.28E+00	3.50E+01	1.23E+00	5.80E-02	1.23E-01	6.05E-02	2.89E-03	-1,17E+01
Water deprivation potential	eq. m^3	8.62E-01	3.04E-03	5.99E-02	9.25E-01	5.70E-03	1.20E-03	5.70E-04	1.42E-03	9.16E-06	-2,19E-01

Table 8. Life cycle assessment (LCA) results for specific product -PC strand– additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1-A4	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA

Table 9 Life cycle assessment (LCA) results for specific product-PC strand - the resource use (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.22E+00	9.43E-03	4.87E-01	3.71E+00	1.77E-02	4.30E-03	1.77E-03	1.11E-03	2.51E-05	-9.72E-01
Consumption of renewable primary energy resources used as raw materials	MJ	1.00E-01	0.00E+00	0.00E+00	1.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.32E+00	9.43E-03	4.90E-01	3.82E+00	1.77E-02	4.30E-03	1.77E-03	1.11E-03	2.51E-05	-9.72E-01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.98E+01	6.57E-01	5.71E+00	3.62E+01	1.23E+00	5.82E-02	1.23E-01	-2.95E+00	2.89E-03	0.00E+00
Consumption of non-renewable primary energy resources used as raw materials	MJ	6.60E-03	0.00E+00	0.00E+00	6.60E-03	0.00E+00	0.00E+00	0.00E+00	3.01E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	2.98E+01	6.57E-01	6.33E+00	3.68E+01	1.23E+00	5.82E-02	1.23E-01	6.06E-02	2.89E-03	-1.13E+01
Consumption of secondary materials	kg	9.44E-02	2.20E-04	3.19E-04	9.49E-02	4.14E-04	5.30E-06	4.14E-05	2.74E-05	6.07E-07	-1.49E-01
Consumption of renew. secondary fuels	MJ	3.37E-03	2.43E-06	7.71E-07	3.38E-03	4.56E-06	2.95E-08	4.56E-07	3.72E-07	1.59E-08	-2.34E-04
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m^3	6.13E-03	8.27E-05	6.97E-03	1.32E-02	1.55E-04	1.58E-05	1.55E-05	5.36E-05	3.16E-06	-9.87E-03

Table 10 Life cycle assessment (LCA) results for specific product - PC strand– waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	2.23E-04	7.38E-04	5.90E-03	6.87E-03	1.38E-03	8.00E-09	6.00E-07	1.38E-04	4.35E-09	3.07E-06
Non-hazardous waste	kg	1.28E+00	1.31E-02	4.69E-02	1.34E+00	2.46E-02	4.16E-07	3.12E-05	2.46E-03	1.14E-02	4.32E-05
Radioactive waste	kg	8.55E-05	4.91E-08	1.64E-05	1.02E-04	9.21E-08	5.80E-10	4.35E-08	9.21E-09	3.23E-07	1.92E-08
Components for re-use	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	0.00E+00	0.00E+00
Materials for recycling	kg	4.90E-07	2.04E-06	1.80E-01	1.80E-01	3.82E-06	8.00E-10	6.00E-08	3.82E-07	4.04E-07	5.78E-09
Materials for energy recovery	kg	2.13E-09	1.65E-08	3.18E-08	5.04E-08	3.09E-08	7.00E-12	5.25E-10	3.09E-09	5.04E-09	6.85E-11
Exported Energy	MJ	6.15E-05	0.00E+00	6.11E-04	6.72E-04	0.00E+00	2.31E-06	1.73E-04	0.00E+00	6.17E-02	0.00E+00

Table 11. Life cycle assessment (LCA) results for specific product -HDPE sheathed strand– environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO_2	2.11E+00	4.45E-02	1.20E-01	2.27E+00	8.34E-02	2.64E-03	8.34E-03	6.39E-02	1.06E-04	-1.39E+00
Greenhouse potential - fossil	eq. kg CO_2	2.62E+00	4.43E-02	1.16E-01	2.78E+00	8.31E-02	2.64E-03	8.31E-03	6.38E-02	1.05E-04	-1.40E+00
Greenhouse potential - biogenic	eq. kg CO_2	2.22E-02	1.51E-04	2.55E-03	2.49E-02	2.84E-04	1.00E-04	2.84E-05	1.33E-05	2.68E-07	4.24E-03
Global warming potential - land use and land use change	eq. kg CO_2	1.69E-03	1.74E-05	1.25E-03	2.96E-03	3.26E-05	1.20E-06	3.26E-06	1.01E-05	9.94E-08	-1.30E-04
Stratospheric ozone depletion potential	eq. kg CFC 11	1.24E-07	1.03E-08	1.18E-08	1.46E-07	1.92E-08	7.00E-11	1.92E-09	7.80E-01	4.26E-11	-5.06E-08
Soil and water acidification potential	eq. mol H+	1.14E-02	1.80E-04	9.26E-04	1.25E-02	3.37E-04	3.80E-05	3.37E-05	5.32E-04	9.90E-07	-5.54E-03
Eutrophication potential - freshwater	eq. kg P	1.31E-03	2.98E-06	9.51E-05	1.41E-03	5.59E-06	6.50E-06	5.59E-07	4.32E-07	9.81E-09	-6.03E-04
Eutrophication potential - seawater	eq. kg N	2.43E-03	5.43E-05	1.29E-04	2.62E-03	1.02E-04	5.50E-06	1.02E-05	1.81E-03	3.45E-07	-1.22E-03
Eutrophication potential - terrestrial	eq. mol N	2.56E-02	5.92E-04	9.41E-04	2.72E-02	1.11E-03	4.65E-05	1.11E-04	3.42E-03	3.77E-06	-1.32E-02
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.08E-02	1.81E-04	3.72E-04	1.14E-02	3.40E-04	1.30E-05	3.40E-05	7.46E-04	1.10E-06	-6.96E-03
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	3.61E-05	1.57E-07	9.30E-08	3.63E-05	2.95E-07	1.67E-08	2.95E-08	1.45E-08	2.42E-10	-2.55E-05
Abiotic depletion potential - fossil fuels	MJ	3.01E+01	6.57E-01	6.28E+00	3.71E+01	1.23E+00	5.80E-02	1.23E-01	6.05E-02	2.89E-03	-1.17E+01
Water deprivation potential	eq. m^3	8.90E-01	3.04E-03	5.99E-02	9.53E-01	5.70E-03	1.20E-03	5.70E-04	1.42E-03	9.16E-06	-2.19E-01

Table 12. Life cycle assessment (LCA) results for specific product - HDPE sheathed strand – additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1-A4	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA

Table 13 Life cycle assessment (LCA) results for specific product- HDPE sheathed strand - the resource use (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.26E+00	9.43E-03	4.87E-01	3.75E+00	1.77E-02	4.30E-03	1.77E-03	1.11E-03	2.51E-05	-9.72E-01
Consumption of renewable primary energy resources used as raw materials	MJ	1.00E-01	0.00E+00	0.00E+00	1.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.36E+00	9.43E-03	4.90E-01	3.85E+00	1.77E-02	4.30E-03	1.77E-03	1.11E-03	2.51E-05	-9.72E-01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.07E+01	6.57E-01	5.71E+00	3.71E+01	1.23E+00	5.82E-02	1.23E-01	-2.95E+00	2.89E-03	0.00E+00
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.13E+00	0.00E+00	0.00E+00	1.13E+00	0.00E+00	0.00E+00	0.00E+00	3.01E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	3.19E+01	6.57E-01	6.33E+00	3.89E+01	1.23E+00	5.82E-02	1.23E-01	6.06E-02	2.89E-03	-1.17E+01
Consumption of secondary materials	kg	9.45E-02	2.20E-04	3.19E-04	9.50E-02	4.14E-04	5.30E-06	4.14E-05	2.74E-05	6.07E-07	-1.49E-01
Consumption of renew. secondary fuels	MJ	3.37E-03	2.43E-06	7.71E-07	3.38E-03	4.56E-06	2.95E-08	4.56E-07	3.72E-07	1.59E-08	-2.34E-04
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.70E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m^3	6.89E-03	8.27E-05	6.97E-03	1.40E-02	1.55E-04	1.58E-05	1.55E-05	5.36E-05	3.16E-06	-9.87E-03

Table 14 Life cycle assessment (LCA) results for specific product - HDPE sheathed strand – waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	1.49E-03	7.38E-04	5.90E-03	8.14E-03	1.38E-03	6.00E-07	1.38E-04	4.35E-09	3.07E-06	-1.39E-04
Non-hazardous waste	kg	1.32E+00	1.31E-02	4.69E-02	1.38E+00	2.46E-02	3.12E-05	2.46E-03	1.14E-02	4.32E-05	1.81E-01
Radioactive waste	kg	8.68E-05	4.91E-08	1.64E-05	1.03E-04	9.21E-08	4.35E-08	9.21E-09	3.23E-07	1.92E-08	1.98E-05
Components for re-use	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	0.00E+00	0.00E+00
Materials for recycling	kg	4.57E-06	2.04E-06	1.80E-01	1.80E-01	3.82E-06	6.00E-08	3.82E-07	4.04E-07	5.78E-09	0.00E+00
Materials for energy recovery	kg	1.28E-08	1.65E-08	3.18E-08	6.10E-08	3.09E-08	5.25E-10	3.09E-09	5.04E-09	6.85E-11	0.00E+00
Exported Energy	MJ	3.20E-03	0.00E+00	6.11E-04	3.81E-03	0.00E+00	1.73E-04	0.00E+00	6.17E-02	0.00E+00	0.00E+00

VERIFICATION

The process of verification of this EPD was in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804:2012+A1:2019 and ITB PCR A (2023)
Independent verification corresponding to ISO 14025 (sub clause 8.1.3.) [X] external [ ] internal
External verification of EPD: Halina Prejzner, PhD. Eng. LCA, LCI audit and input data verification: Michał Piasecki, PhD., D.Sc., Eng.

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the information provided and contained in EPD. Declarations of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A General Product Category Rules for Construction Products (v1.6,2023)
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- https://ecoinvent.org/

LCA,LCI, input data verification
Michał Piasecki, PhD. D.Sc.

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CERTIFICATE № 672/2024
of TYPE III ENVIRONMENTAL DECLARATION

Products:

PC wire and strand with low relaxation (Hlohovec)

Manufacturer:

Bekaert Hlohovec, a.s.
Mierová 2317, 920 28 Hlohovec, Slovakia

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued on 13th September 2024 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, September 2024