Environmental Product Declaration Type III ITB No. 284/2021

Issuance date: 31.12.2021
Validity date: 31.12.2026

Mesh Track® - steel - based structural asphalt reinforcement solution

EPD Program Operator:

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

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804 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. Their aspects were verified by the independent body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804 (see point 5.3 of the standard).

Life cycle analysis (LCA): A1-A4, C1-C4 and D modules in accordance with EN 15804
(Cradle to Gate with options)
The year of preparing the EPD: 2021
Service Life: not declared by producer
PCR: ITB-PCR A (PCR based on EN 15804)
Declared unit: 1 kg of product
Product Standards: EN 15381
Reasons for performing LCA: B2B
Representativeness: manufactured in Slovakia, year 2020

PRODUCTS DESCRIPTION

Bekaert (www.bekaert.com) is a global producer of steel wire reinforcement solutions for a wide range of applications. For roads and pavements, Bekaert offers two types of reinforcement solutions for specific road works. Mesh Track® - steel-based structural asphalt reinforcement solution covered by this EPD is produced in the manufacturing plant, located at Hlohovec, Slovakia. Bekaert produces Mesh Track® in different variants according the application used at supplier side. Mesh Track® is a woven hexagonal wire netting manufactured of Bezinal® coated steel wire reinforced in transverse direction at regular intervals by flat alternately twisted reinforcing wires interwoven in the mesh. Mesh Track® is used as reinforcement netting for road construction and foundations: for armouring of asphalt when recovering concrete roads and in case of ruts and for armoring of asphalt when recovering cracked asphalt roads. Figure 1 shows an application overview.

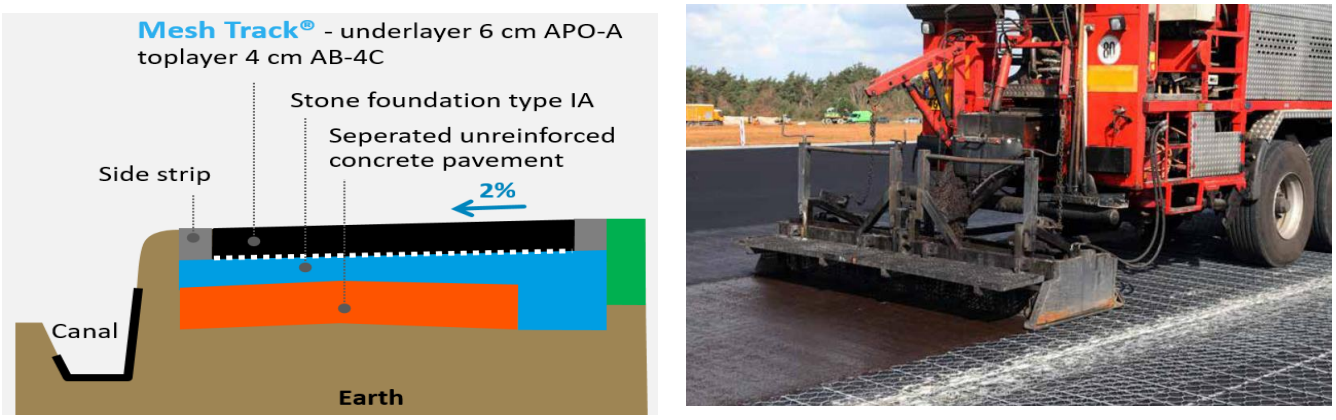


Figure 1. The concept of the Mesh Track® implementation in a road structure

A specific product technical data is available at manufacturer website Bekaert.com

PRODUCT APPLICATION

Declared technology gives an technical opportunity to repair serious damage to the pavement resulting, among others, from the loss of load capacity.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 kg of Mesh Track®. In order to convert the results of the environmental assessment from kilogram to square meter, the equivalence factors given in Table 1 should be used.

Table 1. The Equivalents (m^2/kg) of Mesh Track® per product type

Type	Standard width m	equivalence factors m^2 / kg
Mesh Track 1	2	0.56
	3	0.57
	3.3	0.56
	4	0.57
Mesh Track 2	2	0.75
	3	0.77
	3.3	0.75
	4	0.77

System boundary

The life cycle analysis of the declared product covers “Product Stage” A1-A3 modules, “transport to site” A4, “End of Life stage” C1, C2, C3, C4 modules and gains and loads beyond system in D module (Cradle to Gate with options) in accordance with EN 15804 and ITB PCR A.

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of mesh is a line process in a manufacturing plant located at Hlohovec, Slovakia (see Figure 2). Allocation of impacts is done on product mass basis where no specific allocation for mesh production based on manufacturer information were provided. All impacts from raw materials production (wire rod, coated half product, coating product, soaps, HCl, pallets) are allocated in A1 module of the LCA. Minimum 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 from supplier to manufacturing plant (Hlohovec). Municipal wastes of the factory were allocated to module A3. Energy supply and electricity (ZSE) was inventoried and 100% was allocated to the product assessed. Emissions in the factory are assessed using Ecoinvent data for energy carriers.

System limits

Minimum 99% input materials and 100% energy consumption (electricity, gas) 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), utilized thermal energy, and electric power consumption, direct production waste, and available emission measurements. Tires consumption for transport was not taken into account. Precomponents with a percentage share of less than 0.2% were excluded from the calculations. It is assumed that the total sum of omitted processes does not exceed 0,5% of all impact categories. In accordance with EN 15804 machines (for example widia dies) 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 based on valid Ecoinvent data. 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

The production process (Hlohovec plant) is presented in Figure 2.

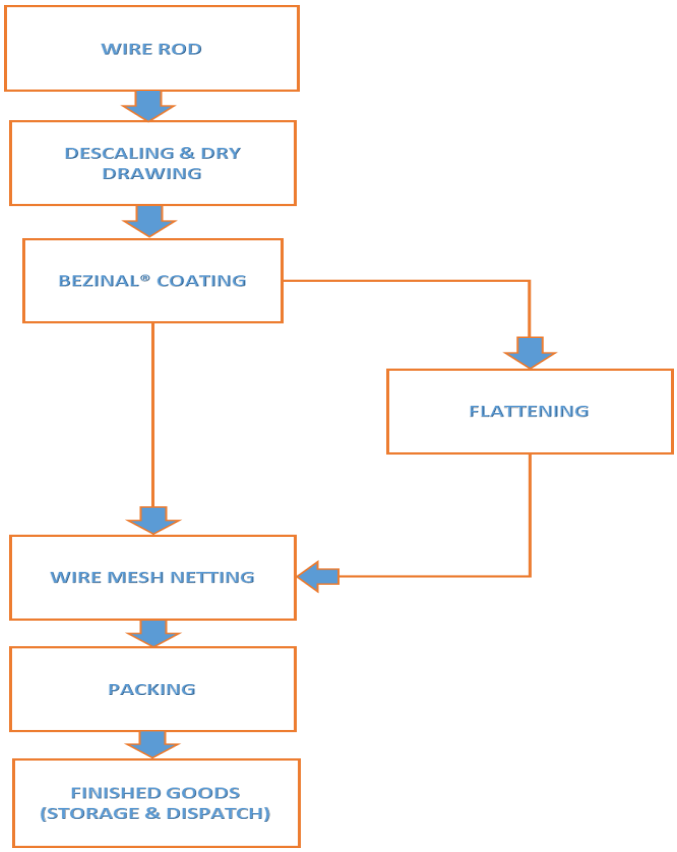


Figure 2. A schematic diagram of the industrial process (A3 module)

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.

End of life scenarios (C and D modules)

The end-of-life scenario has been generalized. The asphalt with the steel mesh are disassembled (C1 module) by grappling hooks mounted onto heavy equipment and collected mechanically. 95% material recovery during demolishing was assumed. The manufacturer declares the technology and the scenario in which the mesh can be separated from waste up to 95%. 5% goes to a landfill. 10 % of recovered steel product can be reused or adapted to new applications (road reinforcement). 90% of recovered steel can be used for new steel production (EAF process). 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. Materials recovered from dismantled products are recycled according to the BAT treatment practice. 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 2. End of life scenarios for Mesh Track® products

Progress products	Material recovery from road	Reuse	Recycling	Landfilling
Steel products	95%	10%	90%	5%

Data collection period
The data for manufacture of the declared products refer to period between 01.01.2020 – 31.12.2020 (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 steel products characteristics based on Ecoinvent data. 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 product were aggregated using weighted average where there was no option to separate impact on Mesh Track® production process- The mass inter-branch flows were taken into account. All production processes (A3) at Holhovec plant were assigned to different types of products in a way based on the information provided by manufacture in LCI.

Calculation rules
LCA was done in accordance with ITB PCR A document. Characterization factors are CML ver. 4.2 based. ITB-LCA algorithms were used for impact calculations. A1 was calculated based on data from the database, A3 and A2 are calculated based on the LCI questionnaire provided by the manufacturer.

Databases
The background data for the processes come from the following databases: Ecoinvent v.3.8 (steel, Zink, Nitrogen, HCl, soap, ancillary items, packaging), ZSE (Czech electricity mix and combustion factors for fuels). Specific (LCI) data quality analysis was a part of the audit. The time related quality of the data used is valid (5 years).

Additional information
Specific CO_2 emissions, related to the total electricity supplied to the Slovak electricity system, reached in 2020 the historically lowest level thanks to a balanced energy mix with a high share of electricity production from nuclear and hydro power plants and lower supply from thermal power plants burning fossil fuels, while decreasing by more than 20% year on year. Slovak electricity mix used is 0.107 kg CO_2/kWh..

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit
The declaration refers to the unit DU– 1 kg of the Mesh Track® (table 4). 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 4. Environmental product characteristic – 1 kg of Mesh Track®

Environmental impacts: (DU) 1 kg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2	7.14E-01	2.39E-02	3.19E-01	5.25E-02	2.52E-03	3.20E-03	1.68E-03	3.00E-03	-2.36E-01
Depletion potential of the stratospheric ozone layer	kg CFC 11	4.89E-08	0.00E+00	1.17E-08	0.00E+00	2.89E-11	0.00E+00	1.92E-11	1.15E-10	-4.49E-09
Acidification potential of soil and water	kg SO_2	3.17E-03	1.84E-04	9.82E-04	4.16E-04	2.31E-06	2.21E-05	1.53E-06	3.50E-06	-9.11E-04
Formation potential of tropospheric ozone	kg Ethene	1.58E-04	1.24E-05	4.07E-05	2.67E-05	1.19E-05	1.48E-06	7.94E-06	6.50E-07	-1.02E-04
Eutrophication potential	kg $(PO_4)^{3-}$	1.54E-03	3.25E-05	4.46E-04	7.38E-05	9.61E-08	3.90E-06	6.39E-08	1.72E-06	-3.17E-04
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb	5.70E-04	0.00E+00	7.56E-04	0.00E+00	1.94E-05	0.00E+00	1.29E-05	6.00E-05	-2.18E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	7.85E+00	3.27E-01	1.31E+00	7.17E-01	3.00E-02	3.92E-02	2.00E-02	1.30E-02	-2.19E+00
Environmental aspects: (DU) 1 kg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	2.60E+00	3.27E-03	1.45E+00	7.17E-03	4.50E-03	3.92E-04	2.99E-03	0.00E+00	-3.56E-01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.11E+01	3.43E-01	5.27E+00	7.50E-01	3.30E-02	4.12E-02	2.19E-02	1.35E-02	-2.52E+00
Use of secondary material	kg	1.40E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.19E-02
Use of renewable secondary fuels	MJ	6.75E-08	1.72E-02	0.00E+00	3.77E-02	0.00E+00	2.06E-03	0.00E+00	0.00E+00	-4.66E-04
Use of non-renewable secondary fuels	MJ	8.87E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-0.00E+00
Net use of fresh water	m^3	1.95E-02	3.50E-06	4.54E-03	1.29E-06	9.48E-06	4.20E-07	6.30E-06	1.00E-05	-1.01E-04
Other environmental information describing waste categories: (DU) 1 kg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	4.30E-04	1.26E-05	2.70E-02	4.64E-06	4.00E-08	1.51E-06	2.66E-08	1.90E-08	-1.01E-04
Non-hazardous waste disposed	kg	4.89E-01	1.49E-02	2.08E-02	5.51E-03	3.61E-04	1.79E-03	5.02E-02	5.01E-03	-3.98E-02
Radioactive waste disposed	kg	1.14E-04	0.00E+00	4.80E-06	0.00E+00	4.00E-08	0.00E+00	2.66E-08	7.20E-08	-2.95E-05
Components for re-use	kg	5.31E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.50E-02	0.00E+00	-8.36E-04
Materials for recycling	kg	9.12E-05	0.00E+00	6.60E-02	0.00E+00	0.00E+00	0.00E+00	8.55E-01	0.00E+00	-7.72E-06
Materials for energy recover	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	-1.15E-06
Exported energy	MJ	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

RESULTS INTERPRETATION

The environmental impact of Mesh Track® product (cradle to gate with options) is largely dependent on the energy-intensive production of steel on which the manufacturer has a limited influence. The carbon impact of steel production (Wire Rods) in the product stage A1 is as high as 85%. The impact of the production line A3 largely depends on the amount of electricity consumed for drawing and coating process by manufacturing plant (0.479 kWh/kg of product). LCA results show that the cradle-to-gate carbon (Global Warming Potential) impact of 1 kg of Mesh Track® production is 1.06 kg CO_2eq. For comparison a ton of steel produced worldwide in 2019 emitted on average 1.85 tons of carbon dioxide. The LCA results show that the cradle-to gate primary energy demand of fossil fuel is equal 9.48 MJ. The products due to the high potential for recycling (95%) and has noticeable D module (benefit to other product system) potential. Mesh Track® is almost cradle-to-cradle. While it cannot be milled, the steel can be reprocessed without losing material integrity.

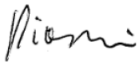
VERIFICATION

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 and ITB PCR A
Independent verification corresponding to ISO 14025 (sub clause 8.1.3.) [x] external [ ] internal
External verification of EPD: Ph.D. Eng. Halina Prejzner LCA. LCI audit and input data verification: Ph.D. D.SC.Eng. Michał Piasecki. m.piasecki@itb.pl Verification of LCA: Ph.D. Eng. Justyna Tomaszewska. j.tomaszewska@itb.pl

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- EN 15381: 2008 Geotextiles and geotextile-related products - Characteristics required for use in pavements and asphalt overlays
- LCI DATA FOR STEEL PRODUCTS at https://www.worldsteel.org/en/dam/jcr:04f8a180-1406-4f5c-93ca-70f1ba7de5d4/LCI%2520study_2018%2520data%2520release.pdf
- 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
- EN 15804 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- https://www.seas.sk/co2-emissions



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02-656 Warsaw, Ksawerów 21

CERTIFICATE № 284/2021
of TYPE III ENVIRONMENTAL DECLARATION

Product:

Mesh Track® - steel-based structural asphalt reinforcement solution

Manufacturer:

N.V.Bekaert S.A.

Bekaertstraat 2, 8550 Zwevegem, Belgium

Produced in the manufacturing plant,

Bekaert Hlohovec a. s.

Micrová 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

PN EN 15804

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

This certificate, issued for the first time on 31st December 2021 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, December 2021