ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	KRAIBURG STRAIL GmbH & Co. KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-KRA-20250450-IBI1-EN
Issue date	24.09.2025
Valid to	23.09.2030

STRAIL Railroad crossing system

KRAIBURG STRAIL GmbH & Co. KG

Institut Bauen und Umwelt e.V.

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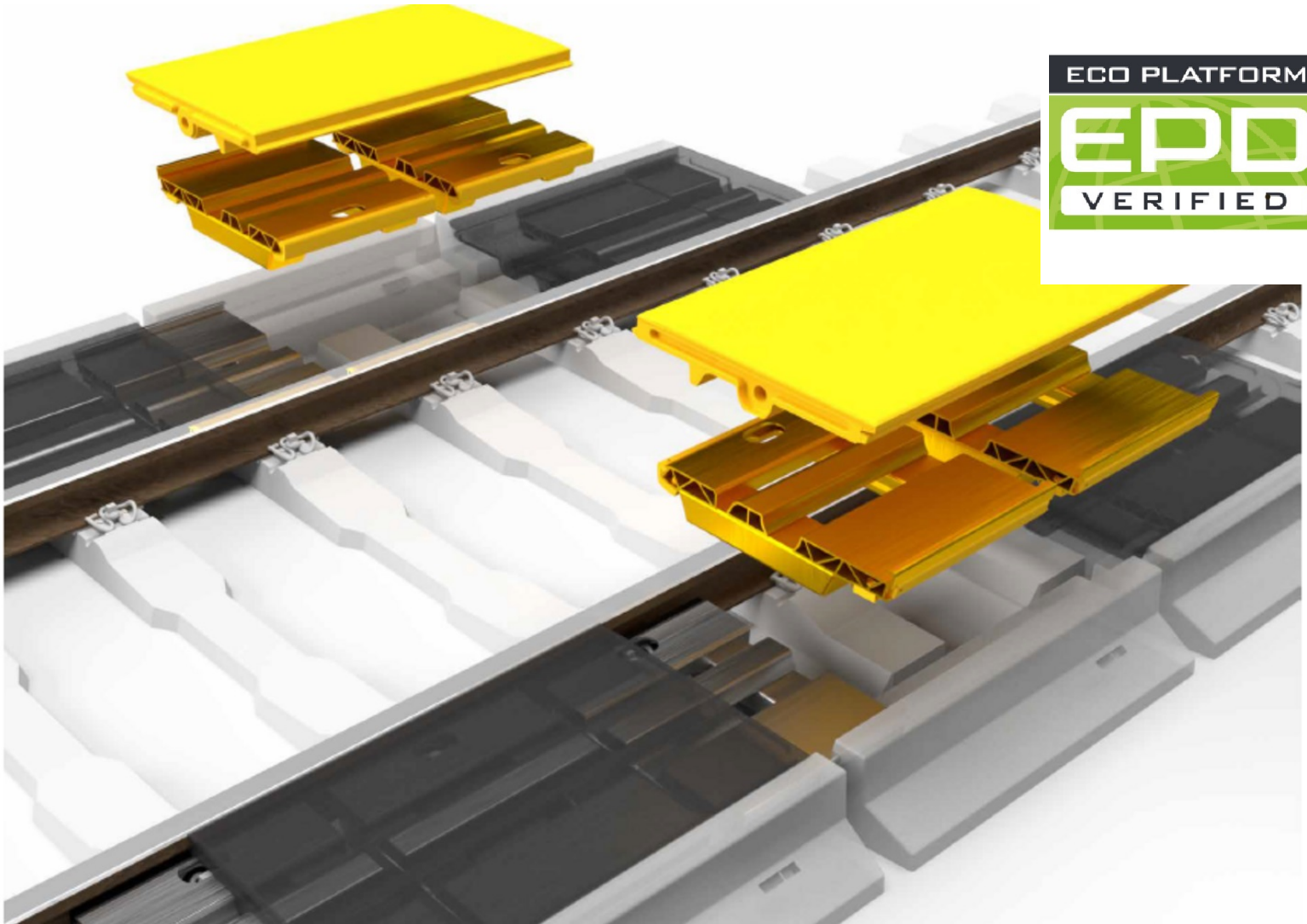
ECO PLATFORM EPD VERIFIED



1. General Information

KRAIBURG STRAIL GmbH & Co. KG

Programme holder

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

Declaration number

EPD-KRA-20250450-IBI1-EN

This declaration is based on the product category rules:

Special product, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

24.09.2025

Valid to

23.09.2030

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

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

STRAIL Railroad crossing system

Owner of the declaration

KRAIBURG STRAIL GmbH & Co. KG
Göllstraße 8
84529 Tittmoning
Germany

Declared product / declared unit

1 running meter STRAIL Railroad crossing system (1 m)

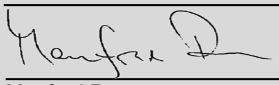
Scope:

This EPD declares 1 running meter STRAIL Railroad crossing system of KRAIBURG STRAIL GMBH & Co. KG. The data collection refers to the year 2024 for a production plant in 84529, Tittmoning, Germany.
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



Manfred Russ,
(Independent verifier)

2. Product

2.1 Product description/Product definition

The declaration covers STRAIL Railroad crossing systems consisting of rubber inner and outer panels, as well as steel bracing systems, aluminium beams and kerbstones. The declaration applies to STRAIL Railroad crossing systems with pontiSTRAIL as a product for high traffic loads, innoSTRAIL for medium traffic loads and pedeSTRAIL for pedestrian and bicycle traffic. The overall results refer to the railroad crossing system with pontiSTRAIL, as this system has the highest requirements and therefore the potentially highest environmental impact. The results are representative of the above-mentioned systems.
Product for which no legal provisions for harmonisation of the EU exist.
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

STRAIL Railroad crossing systems serve to ensure safety and smooth traffic flow at locations where roads and railways intersect. Depending on the load, the systems have specific applications with different requirements for the inner and outer panels:

- **pontiSTRAIL**: The outer panel system for covering railroad systems in the crossing area for high loads.
- **innoSTRAIL**: Rail sleeper spacing-independent panel system for covering track systems in the inter-rail area for medium and high traffic loads.
- **pedeSTRAIL**: Rail sleeper spacing-independent panel system for pedestrians, cyclists and emergency crossings, for covering tracks in the crossing area.

2.3 Technical Data

The technical data for the products covered by the EPD are based on the following for the inner and outer panels:

- *DIN EN 13036-4*
- *DIN ISO 48-4*
- *DIN EN ISO 1183*
- *DIN 53504*

Structural properties

Name	Value	Unit
Density	1,15 ± 0.04	kg/m^3
Hardness	70 ± 8	Shore A
Flexural strength	> 2	N/mm^2
Tensile strength	> 40	N/mm^2

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

2.4 Delivery status

The respective system components are delivered separately to the installation site. Dimensions may vary depending on the type of sleeper and rail. Possible standard dimensions for the system are as follows:

- Inner panel: width = 1200 mm, length = 1500 mm
- Outer panel: Width equals track gauge + oversize, length = 1200 mm
- kerbstones: width = 400 mm, length = 600/900/1200/1800 mm, height = 250 mm

2.5 Base materials/Ancillary materials

Composition of the product

STRAIL rubber panels, steel bracing systems, aluminium beams, concrete kerbstones, laying mortar (if required) and concrete laying foundations are used to construct the railroad crossing system.
The composition of 1 running meter of railroad crossing system is as follows:

Name	Value	Unit
Rubber	37	Mass-%
Steel	2	Mass-%
Aluminium	2	Mass-%
Concrete (reinforced)	57	Mass-%
Laying mortar	2	Mass-%

This product/article/at least one partial article contains substances listed in the candidate list (date: 21.02.2025) exceeding 0.1 percentage by mass: no.

This product/article/at least one partial article contains other 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

Rubber panels: Shredded secondary material from tyre processing, old tyres and rework material from old STRAIL rubber panels (post-consumer waste) are mixed with primary rubber, caoutchouc and special additives to achieve the desired properties of the rubber slabs. The mixture is then vulcanised in appropriate moulds under pressure and temperature. Vulcanisation cross-links the polymer structure, giving the STRAIL panel its durability and typical rubber properties. After vulcanisation, the rubber plates are tested for quality and properties.
Precast concrete elements: The laying foundations and kerbstones are manufactured in external plants. Reinforcing steel is placed in the appropriate mould. This is followed by mixing the concrete ingredients (cement, sand, gravel, water and additives) in a concrete mixer. The freshly mixed concrete is poured into the prepared mould, compacted and levelled. After hardening, the finished part is removed from the mould and prepared for transport.
Steel bracing system: The bracing system (bracing rod made of 25CrMo4 steel) is also manufactured in external plants.
Aluminium beams: The aluminium beam (standard alloy EN AW-6063) is also manufactured as an extruded aluminium profile at an external plant.

2.7 Environment and health during manufacturing

The production facilities are equipped with extraction systems. There is no health risk to employees.

2.8 Product processing/Installation

The components are installed as a complete system on site. Following the instructions, the kerbstones, aluminium beams and inner and outer panels are laid and then secured using the tensioning system. Installation can be carried out manually or using an excavator.

2.9 Packaging

Depending on the installation location, different packaging requirements apply. It is not possible to specify these requirements, and therefore packaging is not declared (see section 3.4). Reusable wooden pallets are used in some cases.

2.10 Condition of use

No change in the condition of use during the service life is known when used properly.

2.11 Environment and health during use

There are no known effects on the environment or health during use.

2.12 Reference service life

According to the manufacturer's estimate, the technical service life of the rubber sheets is 15 to 20 years. The actual service life depends primarily on the stress and total service life of the usable/traffic area. A reference service life is not specified. Relevant ageing processes are not known.

2.13 Extraordinary effects

Fire

According to EN 13501-1 the products (rubber panels) are C-s2 classified. Concrete, aluminium and steel are considered non-inflammable; the material does not exhibit burning droplets or significant smoke development.

Fire protection (rubber panels)

Name	Value	Unit
Building material class	C	-
Burning droplets	d0	-
Smoke gas development	s2	-

Water

No impacts on the environment following the unforeseeable influence of water are known.

Mechanical destruction

No impacts on the environment following unforeseeable mechanical destruction are known.

2.14 Re-use phase

The rubber panels can be processed into new panels. Thermal recycling is also possible. Aluminium and steel can generally be recycled into new products. After crushing and grinding, concrete can be reused as aggregate in concrete production or as gravel substitute in substructures.

2.15 Disposal

After the useful life phase, the components of the railroad crossing system can be utilised according to chap. 2.14. In the case of disposal, it will be mainly dependent on the dismantling and disposal of the railroad crossing system.
Possible waste codes are:
19 12 04: plastic and rubber
17 04 05: iron and steel
17 04 02: aluminium
17 01 01: concrete
17 01 08: Andere gemischte Bau- und Abbruchabfälle.

2.16 Further information

https://www.strail.de/

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is 1 running meter STRAIL Railroad crossing system

Declared unit and mass reference

Name	Value	Unit
Declared Unit	1	m
Weight by length	1154.3	kg/m
Conversion factor to 1 kg	0.000866	-

3.2 System boundary

The system boundary of the EPD takes into account the following life cycle phases: from cradle to gate with options

- Product stage (A1–A3)
- Construction process stage (A4–A5)
- End of life stage (C1–C4)
- Benefits and loads beyond the system boundary (D)

A1–A3

Module A1 covers all relevant processes necessary for the provision of raw materials and intermediate products. Germany is designated as the production location for the intermediate products. Module A2 covers all relevant transport processes for raw materials and preliminary products to the production site; lorries are used for this purpose. Module A3 describes the manufacture of the declared product at the production site. Electricity and thermal energy from natural gas are used in the manufacture of the product.

A4–A5

Module A4 describes the average transport of the product from the production site to the installation site. The products are generally distributed worldwide (see Chapter 4, 'Transport to the construction site (A4)'). Module A5 describes the installation of the product using an excavator.

C1–C4

Module C1 covers the dismantling of the product using excavators. Module C2 covers transport to waste treatment (module C3). Module C3 covers waste treatment for reuse, recovery and/or recycling. For reuse and the manufacture of new rubber panels, these are shredded after dismantling (see Chapter 4, 'End of life (C1–C4)'). Concrete is also broken up and shredded for reuse. Steel and aluminium can be recycled, and the corresponding ecological burdens and benefits are shown in Module D. A small amount (5%) of steel recycling waste is sent to landfill (C4).

D

Module D covers reuse, recovery and/or recycling potential. These are stated as net flows and benefits. This concerns the avoidance of primary materials through the provision of gravel, steel and aluminium, as well as the resulting ecological benefits from the thermal utilisation of rubber sheets (see Chapter 4, 'Reuse, recovery and recycling potential (D), relevant scenario information').

3.3 Estimates and assumptions

The electricity mix used in Module A3 represents the residual electricity mix in Germany (0.858 kg CO2 eq. per kWh), including the most important producers and self-producers as well as electricity imports. The most important technologies for combustion, flue gas cleaning and electricity generation are taken into account in accordance with the national situation. Diesel-powered EURO 6 trucks are assumed for transport. They have a payload of 28–32 tonnes (uniformly selected payload value: 22 t) and the route share consists of 56%

motorway, 28% interurban road and 16% urban traffic. The mass utilisation of the lorries is assumed to be 61%. For module A4, an average transport distance of 800 km is assumed. Estimates (35 km) have been made for transport distances in module C2.
A scrap/loss of 0.1% is assumed for the manufacture of the inner panel, outer panel and rail fitting. This is incinerated in A3. Due to the modularity of railroad crossing systems, there are no losses during the installation and removal of the individual components and a collection rate of 100% is assumed. Excavators are used to install and remove the rubber panels in module A5 of the STRAIL railroad crossing system. This, as well as the specific diesel requirement, is mapped using processes and data sets from the background database. The diesel requirement is calculated on a mass basis.

3.4 Cut-off criteria

All known inputs and outputs associated with the products were taken into account. Equipment, machinery and infrastructure required for manufacturing were not considered. No product-specific data could be collected for packaging, which, based on a conservative plausibility assessment, falls under the criteria defined in EN 15804 Chapter 6.3.6.

3.5 Background data

The life cycle assessment model is created using the 'LCA for Experts' software system from Sphera Solutions GmbH. The database version CUP2024.2 is used. The database provides the life cycle inventory data for raw and auxiliary materials, energy and transport processes, which are mapped by the background system.

3.6 Data quality

When collecting data for the foreground system, care was taken to ensure that the mass balance for the processes within the system boundary is closed. Therefore, the completeness of the foreground system is rated as high. The data provided for the foreground system was measured or calculated. Therefore, its accuracy is rated as high. The completeness and accuracy of the background data, all of which comes from database version CUP2024.2, are documented in the respective data sets. The reference year for the data sets for raw and auxiliary materials/intermediate products and transport processes is predominantly 2023 and 2020 for electrical and thermal energy. There are restrictions for two data sets as the reference years refer to 2013 and 2015. Nevertheless, the data sets were used because manufacturer-specific data describe the product better than alternative, generic data sets with longer validity. Both data sets are validated and thus constitute the most reliable data source and originate from the valid background database. Generic data sets were used for the concretes under consideration and the precursor products steel and aluminium. The input and output flows of all mass and energy flows, as well as the associated processes and data sets, are transparently documented and disclosed. Based on this information, it is possible to reproduce the results of this study, provided that the methodology is followed and the same data sets are used.

3.7 Period under review

The primary data for the foreground system was recorded by KRAIBURG STRAIL GMBH & Co. KG. The data collected at the plant relates to the year 2024. The data records from the background database are representative for the period under review.

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: Germany

3.9 Allocation

No further by-products or co-products arise from the life cycle under consideration and the associated production processes. This means that no allocations had to be made. In order to highlight advantages and burdens outside the product system, a system space extension is carried out within Module D, taking into account the secondary materials used in A1-A3 (net flow calculation). This concerns the thermal recycling of rubber sheets and the presentation of ecological advantages through the avoidance of primary materials (gravel, steel and aluminium) at the end of the life cycle.

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 database version CUP2024.2 is used.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The STRAIL railroad crossing system product has a biogenic carbon content of 156.38 kg at the factory gate. No packaging is declared.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	156.38	kg C
Biogenic carbon content in accompanying packaging		kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

The following technical information is the foundation of the declared module or can be used for the development of specific scenarios in the context of a building evaluation, in the case that modules are not declared (MND).

Transport to the building site (A4)

The declared product is generally distributed worldwide. The transport scenario in Module A4 is limited to distribution in Europe with an average transport distance of 800 km by lorry.

Name	Value	Unit
Transport distance	800	km
Capacity utilisation (including empty runs)	61	%
Total mass	1154.3	kg

Installation into the building (A5)

The installation of individual components that cannot be laid by hand is carried out using suitable construction machinery. A diesel-powered excavator is assumed for this purpose.

Name	Value	Unit
Fuel consumption	0.11	kg/m

End of life (C1-C4)

Dismantling in C1 is carried out in the same way as installation, using excavators. Module C2 represents transport to waste treatment (C3). The transport distance is 35 km. Module C3 represents waste treatment for reuse, recovery and/or

recycling. Two end-of-life scenarios are declared for the rubber panels:
Szenario 0: Material recycling of the inner and outer panel and the rail fitting.
Szenario 1: Energy recovery of the inner and outer panel and the rail fitting.
Shredding the rubber sheets (C3) results in a loss of 5% (recycling rate of 95%). This loss is incinerated. The aluminium support and the tensioning system also have a recycling efficiency of 95%. Concrete from the kerbstone and foundation as well as mortar undergo a 'treatment process' ('construction waste processing') in C3. The loss within this process is 3%, resulting in a recycling rate of 97%. The crushed material can be reused, for example, in road construction (substitution of crushed stone/gravel in module D).
Aluminium and steel are also recycled, with a collection rate of 100%. Losses during the steel processing process (5%) are sent to landfill (C4).

Name	Value	Unit
Collected separately waste type rubber, steel, aluminium, concrete	1154.3	kg
Fuel consumption C1	0.11	kg
Material recycling (szenario 0)	1110.3	kg
Material recycling (szenario 1)	702.5	kg
Energy recovery (szenario 0) , 5 % loss of rubber panels	21.4	kg
Energy recovery (szenario 1)	429.2	kg
Disposal losses steel recycling	0.97	kg

Reuse, recovery and recycling potential (D), relevant scenarios

Module D covers reuse, recovery and/or recycling potential. These are stated as net flows and benefits/loads. Corresponding benefits/loads are only attributed to the primary material components.

Name	Value	Unit
Net flow for generated thermal energy (D)	11.62	MJ
Net flow for generated thermal energy (D1)	228	MJ
Net flow for generated electrical energy (D)	4.94	MJ
Net flow for generated electrical energy (D1)	96.8	MJ
Net flow for replacement of crushed stone/gravel	630.9	kg
Net flow for avoided primary aluminium	6.51	kg
Net flow for additional steel demand	6.63	kg

5. LCA: Results

Below, the results are shown of the impact assessment of selected environmental impacts, the utilisation of resources and wastes and other output flows for 1 m STRAIL railroad crossing system produced in Tittmoning. In the table below, all declared life cycle process stages are marked with "X', all stages not declared are marked 'MND'. (Modules B3, B4 and B5 are not relevant and are thus marked "MNR'.)

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = 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	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m STRAIL Railroad crossing system

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	D	D/1
GWP-total	kg CO_2 eq	-1.01E+02	5.18E+01	4.21E+00	3.09E-01	3.56E+01	5.82E+02	7.62E+02	9.5E+00	-6.88E+01	-9.44E+01
GWP-fossil	kg CO_2 eq	4.39E+02	5.06E+01	4.2E+00	3.02E-01	3.48E+01	2.31E+01	2.03E+02	9.48E+00	-6.84E+01	-9.38E+01
GWP-biogenic	kg CO_2 eq	-5.41E+02	2.33E-01	-7.2E-03	1.85E-03	1.95E-01	5.59E+02	5.59E+02	2.85E-03	-3.89E-01	-5.67E-01
GWP-luluc	kg CO_2 eq	6.48E-01	9.73E-01	1.09E-02	5.8E-03	6.69E-01	3.2E-02	5.2E-02	1E-02	-2.85E-02	-3.16E-02
ODP	kg CFC11 eq	4.37E-07	1.6E-11	7.96E-12	9.51E-14	1.1E-11	1.48E-11	1.75E-10	8.78E-14	-4.21E-10	-7.47E-10
AP	mol H^+ eq	1.51E+00	4.86E-02	8.39E-03	4.07E-03	3.37E-02	3.39E-02	2.54E-01	3.45E-02	-2.23E-01	-2.47E-01
EP-freshwater	kg P eq	3.82E-02	1.38E-04	3.31E-06	8.21E-07	9.47E-05	8.69E-06	5.25E-05	8.76E-06	-8.63E-05	-1.52E-04
EP-marine	kg N eq	3.06E-01	1.46E-02	3.33E-03	1.85E-03	1.02E-02	1.29E-02	9.79E-02	1.47E-02	-5.7E-02	-6.59E-02
EP-terrestrial	mol N eq	5.49E+00	1.88E-01	3.67E-02	2.04E-02	1.31E-01	1.48E-01	1.21E+00	1.6E-01	-6.31E-01	-7.25E-01
POCP	kg NMVOC eq	1.09E+00	4.82E-02	9.32E-03	5.56E-03	3.34E-02	3.49E-02	2.56E-01	4.04E-02	-1.57E-01	-1.8E-01
ADPE	kg Sb eq	8.72E-02	8.61E-06	3.09E-06	5.13E-08	5.92E-06	2.16E-06	2.74E-06	9.84E-07	5.93E-05	5.68E-05
ADPF	MJ	5.74E+03	6.64E+02	1.77E+01	3.96E+00	4.57E+02	1.82E+02	3.94E+02	1.52E+02	-9.1E+02	-1.3E+03
WDP	m^3 world eq deprived	2.3E+02	3.63E-01	1.94E-01	2.16E-03	2.49E-01	3.72E+00	6.74E+01	3.99E-01	-8.77E+00	-9.12E+00

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; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m STRAIL Railroad crossing system

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	D	D/1
PERE	MJ	1.59E+03	7.35E+01	4.61E+00	4.38E-01	5.05E+01	9.21E+00	8.41E+01	1.16E+01	-4.33E+02	-5.9E+02
PERM	MJ	9.88E+02	0	0	0	0	-9.88E+02	-9.88E+02	0	0	0
PERT	MJ	2.58E+03	7.35E+01	4.61E+00	4.38E-01	5.05E+01	-9.78E+02	-9.03E+02	1.16E+01	-4.33E+02	-5.9E+02
PENRE	MJ	5.74E+03	6.64E+02	1.77E+01	3.96E+00	4.57E+02	1.82E+02	3.94E+02	1.52E+02	-9.1E+02	-1.3E+03
PENRM	MJ	1.04E+03	0	0	0	0	-1.04E+03	-1.04E+03	0	0	0
PENRT	MJ	6.77E+03	6.64E+02	1.77E+01	3.96E+00	4.57E+02	-8.54E+02	-6.42E+02	1.52E+02	-9.1E+02	-1.3E+03
SM	kg	4.12E+02	0	0	0	0	0	0	0	7.05E+02	6.53E+02
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m^3	2.61E+01	6.87E-02	7.01E-03	4.09E-04	4.72E-02	1.09E-01	1.6E+00	1.68E-02	8.41E-01	7.91E-01

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; 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

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m STRAIL Railroad crossing system

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	D	D/1
HWD	kg	1.18E-01	3.23E-08	9.06E-09	1.93E-10	2.22E-08	1.76E-08	1.95E-07	3.93E-07	3.9E-07	2.57E-08
NHWD	kg	4.3E+01	1.12E-01	1.14E+00	6.69E-04	7.72E-02	2.3E+00	2.65E+01	3.92E+00	-3.94E+01	-3.97E+01
RWD	kg	1.61E-01	1.06E-03	3.73E-04	6.3E-06	7.27E-04	7.24E-03	1.39E-02	5.01E-03	-4.32E-02	-5.72E-02

CRU	kg	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	1.11E+03	7.03E+02	0	0	0
MER	kg	0	0	0	0	0	2.14E+01	4.29E+02	0	0	0
EEE	MJ	9.68E-02	0	0	0	0	4.84E+00	9.67E+01	0	0	0
EET	MJ	2.28E-01	0	0	0	0	1.14E+01	2.28E+02	0	0	0

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

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 m STRAIL Railroad crossing system

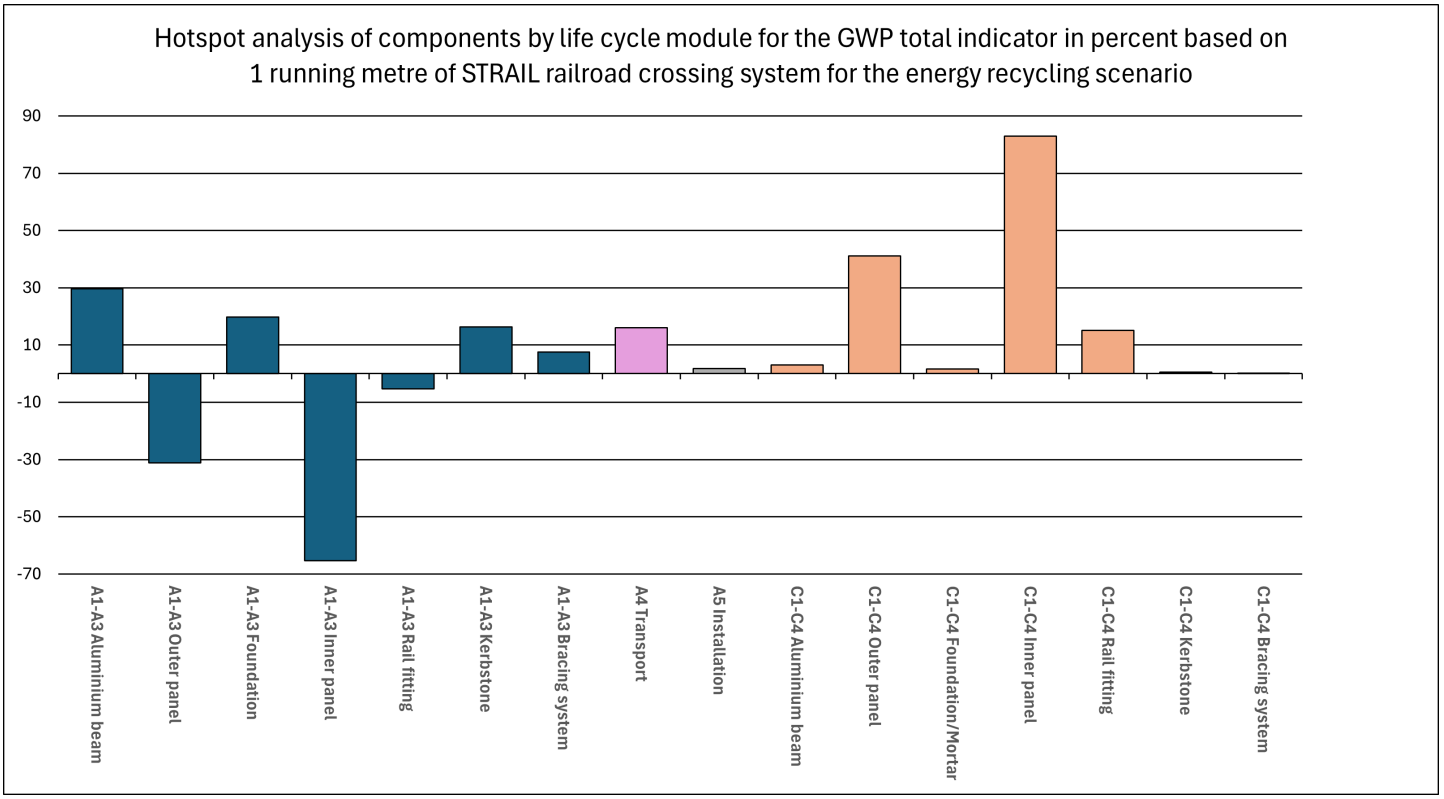
Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	D	D/1
PM	Disease incidence	2.07E-05	5.25E-07	2.99E-07	2.16E-07	3.62E-07	3.72E-07	1.94E-06	2.63E-07	-4.5E-06	-4.66E-06
IR	kBq U235 eq	1.48E+01	1.12E-01	4.18E-02	6.64E-04	7.67E-02	5.23E-01	1.3E+00	7.98E-01	-4.63E+00	-5.96E+00
ETP-fw	CTUe	2.07E+03	5.16E+02	1.11E+01	3.08E+00	3.54E+02	4.57E+01	1.3E+02	1.72E+01	-2.28E+02	-2.79E+02
HTP-c	CTUh	1.72E-07	1.03E-08	3.14E-10	6.12E-11	7.07E-09	2.22E+00	1.02E-08	9.05E-10	-3.32E-01	-6.53E+00
HTP-nc	CTUh	8.58E-06	4.33E-07	1.83E-08	2.62E-09	2.98E-07	1.06E-07	1.23E-06	1.92E-08	-6.75E-07	-8.08E-07
SQP	SQP	2.77E+04	4.42E+02	7.34E+00	3.95E+00	3.04E+02	1.94E+01	9.47E+01	1.48E+01	-1.33E+02	-2.25E+02

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, 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', 'potential comparative toxic unit for ecosystems', '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 as there is limited experience with the indicator.

6. LCA: Interpretation



The production of the aluminium support in particular contributes to the GWP total during the manufacturing phase. The situation is similar for mineral materials (foundation including mortar and kerbstone). The steel in the bracing system also makes a significant contribution to the total GWP during the manufacturing phase. Due to their material composition, the outer panel, inner panel and rail fitting bind biogenic carbon, which leads to a negative contribution to the total GWP in modules A1 – A3. The integration of the inner and outer panels and the rail fitting outweighs other expenses such as energy consumption in A3 and transport in A2, thus resulting in a negative overall contribution in the manufacturing phase.

Due to the transport distance to the installation site and a total mass of 1,154.3 kg to be transported, transport to the installation site is also considered relevant. Assembly plays a minor role in terms of GWP total. The biogenic carbon bound in the inner and outer panels and the rail fitting is released again at the end of its life, which leads to a significant contribution to the core indicator under consideration. The end of life of the mineral and metallic components has little influence. Influences outside the product system (Module D) are not included in the interpretation.

7. Requisite evidence

No evidence is required for placing the product on the market.

8. References

Standards

EN 15804
EN 15804:2012+A1:2013, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

EN 15804
EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

ISO 14025
EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and Procedures.

DIN EN 13036-4
DIN EN 13036-4:2011-12, Road and airfield surface characteristics - Test methods - Part 4: Method for measurement of slip/skid resistance of a surface - The pendulum test.

DIN ISO 48-4
Rubber, vulcanized or thermoplastic - Determination of hardness - Part 4: Indentation hardness by durometer method (Shore hardness) (ISO 48-4:2018)

DIN EN ISO 1183
Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2019, Corrected version 2019-05).

DIN 53504
DIN 53504:2017-03, Testing of rubber - Determination of tensile strength at break, tensile stress at yield, elongation at break and stress values in a tensile test

DIN EN 13501
DIN EN 13501-1:2019-05 Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

Further references

IBU 2021
Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V., Version2.0, Berlin: Institut Bauen und Umwelt e.V., 2021 http://www.ibu-epd.com

LCA for Experts
LCA for Experts Software system and database for Life CycleAssessment, Version 10.8.0.14 – 2024.2. Stuttgart: Sphera Solutions GmbH, 2024.

PCR Part A
Product Category Rules for Building-Related Products and Services. Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, Version 1.4, 15.04.2024, Berlin: Institut Bauen und Umwelt e.V., 2021, http://www.ibu-epd.com

PCR Part B
PCR Guidance-Texts for Building-Related Products and Services, Par B: Requirements on the EPD for Special product, 01.08.2024, Version 11, Berlin: Institut Bauen und Umwelt e.V., https://ibu-epd.com

European Waste Catalog (EWC)
European Waste Catalog - EWC according to AVV of 10.12.2001(BGBl I, p. 3379) last amended by Ordinance of 4.3.2016 (BGBl. I, p. 382).

ECHA-List
List of substances of very high concern eligible for authorisation (as of 13 December 2024) in accordance with Article 59 (10) of the REACH Regulation. European Chemicals Agency

REACH
Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

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