


# Environmental Product Declaration

In accordance with
ISO 14025 and EN 15804:2012+A2:2019/AC:2021

# DOUBLE SIDED GALVANIZED GUARDRAILS

## ACCORDING TO THE DEMANDS OF THE NORWEGIAN MARKET

## Products not yet on the market

## Marcegaglia Buildtech S.r.l.

This EPD covers multiple Double sided galvanized guardrails

Programme: The International EPD® System, www.environdec.com

Programme operator: EPD International AB
Licensee: **EPD International**
EPD registration number: **EPD-IES-0032280**

Type of EPD: **EPD of multiple products, based on the average results of the product group**
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*An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com*

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# GENERAL INFORMATION

## PROGRAMME INFORMATION

| | |
|---|---|
| **Programme:** | The International EPD® System |
| **Address:** | EPD International AB<br>Box 210 60<br>SE-100 31 Stockholm<br>Sweden |
| **Website:** | www.environdec.com |
| **E-mail:** | info@environdec.com |

Standard EN 15804 serves as the Core Product Category Rules (PCR)

Product category rules (PCR):
*Construction products,* 2019:14, version 2.0.1., CPC 412

Complementary Product Category Rules (c-PCR) to PCR 2019:14:
Guardrails and bridge parapets, 2019:14, version 1.0.1, CPC 532

PCR review was conducted by:
The Technical Committee of the International EPD System.
Review chair: Rob Rouwette (chair), Noa Meron (co-chair) – Contact through the secretariat
www.environdec.com/contact

Life Cycle Assessment (LCA)
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Third-party verifier:
Independent third-party verification of the declaration and data, according to ISO 14025, via:
☒ EPD verification by accredited certification body

Third-party verification: *Bureau Veritas Italia S.p.A.* is an approved certification body accountable for the third-party verification
The certification body is accredited by: *Accredia*

Procedure for follow-up of data during EPD validity involves third party verifier:
☒ Yes ☐ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Comparability between EPDs is only achievable if the following performance characteristics are equivalent: declared unit, containment level, level of working width, assumed service life, geographic region, and fulfilment of the same requirements of the applicable standard (EN 1317, NCHRP 350 or MASH).

# COMPANY INFORMATION

**Owner of the EPD:**
Marcegaglia Buildtech S.r.l. - www.marcegagliabuildtech.it

**Contact:**
For more information on this product declaration and/or its configurations, the following references are available:
Technical Support
Mail: technicalsupportmb@marcegaglia.com Phone: +39 0143 7761 / +39 0230 7041

**Company description:**
Marcegaglia Buildtech S.r.l. is a company that manufactures a wide range of construction elements and products, as well as scaffolding for the civil and industrial construction sector thanks to the processing of semi-finished or finished products in steel: these elements include road barriers and guardrails.

**Product/system certifications:**
- Quality management system ISO 9001
- Environmental management system ISO 14001
- Health and safety management system ISO 45001
- Energy management system ISO 50001
- Social responsibility management system SA 8000
- Carbon Footprint Product Systematic Approach ISO 14067
- Road Traffic Safety (RTS) Management System ISO 39001
- UNI PdR 125 (Gender Integrity)
- Carbon Footprint Organization ISO 14064

**Production site name and location:**
Roveri street, 4 – 15068 Pozzolo Formigaro (AL).

# PRODUCTS INFORMATION

**Product name:** Double sided Galvanized guardrails according to the demands of the Norwegian market - Products not yet on the market

**Product identification:** Steel road safety barrier and steel guardrails

**Product description:**

Starting from the semi-finished steel products of guaranteed quality, subsequently hot dip galvanized, safety barriers and guardrails are created, certified by experimental tests, and developed in compliance with the specific regulations of the reference markets. There are several configurations that include safety barriers and guardrails for roads and highways, in steel with containment levels N2, H2, and H4.

The Marcegaglia Buildtech range of safety barriers and steel guardrails is entirely manufactured at the Pozzolo Formigaro plant (Alessandria), which is equipped with the latest production technologies to ensure top product performance. Detailed product catalogs, including comprehensive technical specifications, are available for consultation on the company website.

The EPD presented is based on the assumption and future development of barriers manufactured using low-carbon steel coils as the main raw material. Since these products are not yet commercially available on the market at the time of the study, the declaration is classified as an “EPD not yet on the market.”

## TECHNICAL DATA OF THE PRODUCT

The parameters listed below are specified for each element contained in this study:

- Containment level (eg: T1, N1, H1 etc.);
- Impact severity level (eg: A, B, C);
- Operating width level (eg: W1, W2 etc.);
- Vehicle intrusion class (eg: Vi2, Vi4, Vi8 etc.);
- Normalized dynamic deflection (expressed in meters).

### *Double sided galvanized guardrails*

| Barrier | Containment level | Impact severity level | Working width | Vehicle intrusion | Dynamic deflection | Weight [kg] | Lenght [m] |
|---|---|---|---|---|---|---|---|
| L1DS (increased galvanization) | L1 | A | W4 | VI6 | 1,1 | 90.58 | 4.5 |
| L1DS (increased galvanisation and extended pole) | L1 | A | W4 | VI6 | 1,1 | 96.65 | 4.5 |
| H2SPT W4 (increased galvanization) | H2 | B | W4 | VI5 | 1,2 | 155.34 | 4.5 |
| H2SPT W4 (increased galvanisation and extended pole) | H2 | B | W4 | VI5 | 1,2 | 160.26 | 4.5 |
| L1DS (increased galvanization) | L1 | A | W4 | VI6 | 1,1 | 90.58 | 4.5 |
| L1DS (increased galvanisation and extended pole) | L1 | A | W4 | VI6 | 1,1 | 96.65 | 4.5 |

**UN CPC code**: UN CPC 532 “Civil engineering works”

**Geographical scope**: Global

# LCA INFORMATION

The scope of this EPD is to assess potential environmental impact values for 1 ton of Double galvanized guardrails, based on the Life Cycle Assessment methodology and make them explicit. A description with details on declared unit, system boundaries, key assumptions and flow chart of the lifecycle stages included, is reported in the following paragraphs.

**Declared unit:**
The declared unit of the system considered is the linear meter of the safety barrier.

**Reference service life – RSL:**
The expected durability, as a function of the atmospheric environment in which the road safety barrier is

, such as severe marine atmospheres or in the presence of mechanical damage due to abrasive agents (e.g. wind-blown sand), which can locally accelerate coating degradation.

**Time representativeness:**
The data used is representative of the year 2025.

**Database e software:**
Ecoinvent database v.3.11, April 2025 / Software used SimaPro rel. 10.3.0.1

**Description of system boundaries:**
The study is "Cradle to gate with options, modules C1–C4, module D and with optional modules (A1–A3 + A4-A5 + C1-C4 + D)".
Modules A1-A3 cover material procurement processes (raw and auxiliary materials) as well as production processes.
Module A4 considers the distribution of the finished product to the installation site in Norway. The barriers are first transported by road from the zinc-coating shop to the Port of Genoa, covering a distance of approximately 290 km. At the port, the products are loaded onto a ship and transported by sea to a Norwegian port over a distance of approximately 5500 km. Once in Norway, the barriers complete their journey with approximately 40 km road transport by truck before being delivered to the customer.
Module A5 considers the installation of the finished product at the place of delivery. For the assembly of the barriers, the use of the diesel pile driver for driving the poles into the ground is considered.
Modules C1-C4 consider the uninstallation, transport, sorting and disposal of components deriving from the end-of-life operations of road barriers. These operations are not directly controllable by the company: in this regard, literature data relating to the construction sector are therefore used:

- an average diesel consumption equivalent to 46 MJ for each ton of material demolished;
- an average distance of 300 km to transport the material to the recovery center;
- an average electricity consumption of 28 kWh for each ton of material sorted.

Furthermore, a percentage equal to 11,2% of the steel is considered not destined for recovery operations but is sent to landfill.
Module D considers the potential for recovery and recycling of steel from end-of-life processes: the calculation of the environmental benefits of steel recovery is based on the guidelines provided in the document "Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012 – Par. 6.3.4.6. Benefits and loads beyond the product system boundary, information Module D".

# DESCRIPTION OF MAIN ACTIVITIES

Marcegaglia is the first global manufacturer of steel road safety barriers. Starting from the semi-finished steel products of guaranteed quality, hot-dip galvanized, road barriers are projected, certified by experimental tests and developed in compliance with the specific regulations of the reference markets. The production cycle begins with the arrival of the raw materials in the company by road. The raw materials consist of coils, strips and sheets arriving mainly from the other companies of the Marcegaglia group. After arriving at the factory, the raw materials are processed by the respective plants to obtain the various components that make up the road safety barrier or its accessory component. The materials are partly delivered to the poles and bands profiling lines and partly to the presses to produce auxiliary parts (some components are sent directly to the storage areas). At the end of this part of the production cycle, all the elements that make up the road safety barrier destined for storage are obtained.

## PRODUCTION OF PROFILES FOR POSTS AND CURRENT:

The profiles are produced on profiling lines complete with an automatic unloading section. The initial section consists of the unwinder on which the strips are loaded, to be unrolled and feed the line itself. Downstream of the loading area there is a bench for leveling which, by pressing on the incoming strips metal, eliminates any bends or undulations present. This is followed by the butting area and the actual welding. The semi-finished product then passes to the punching machine where the holes and slots that will be used in the assembly phase of the guardrail are made. The transfer from the punching area to the profile forming area takes place by means of a roller path. The profiling takes place by passing the metal strip through the forming rollers which create the open profile of different shapes and sizes. To avoid excessive overheating due to friction of the material during processing, a cooling emulsion is used. Once the desired shape and size of the section has been obtained, the profile is cut to size in a special guillotine shear. The cut profile then reaches the roller path which transports it to the automatic unloading and packing area. This last operation consists in the manual strapping of the bundles of profiles. The packs are then placed in the finished product storage area by forklift.

## WAVES PRODUCTION:

The activity consists in the production of guardrail waves beam starting from the strips that are transported to the entrance to the profiling line.



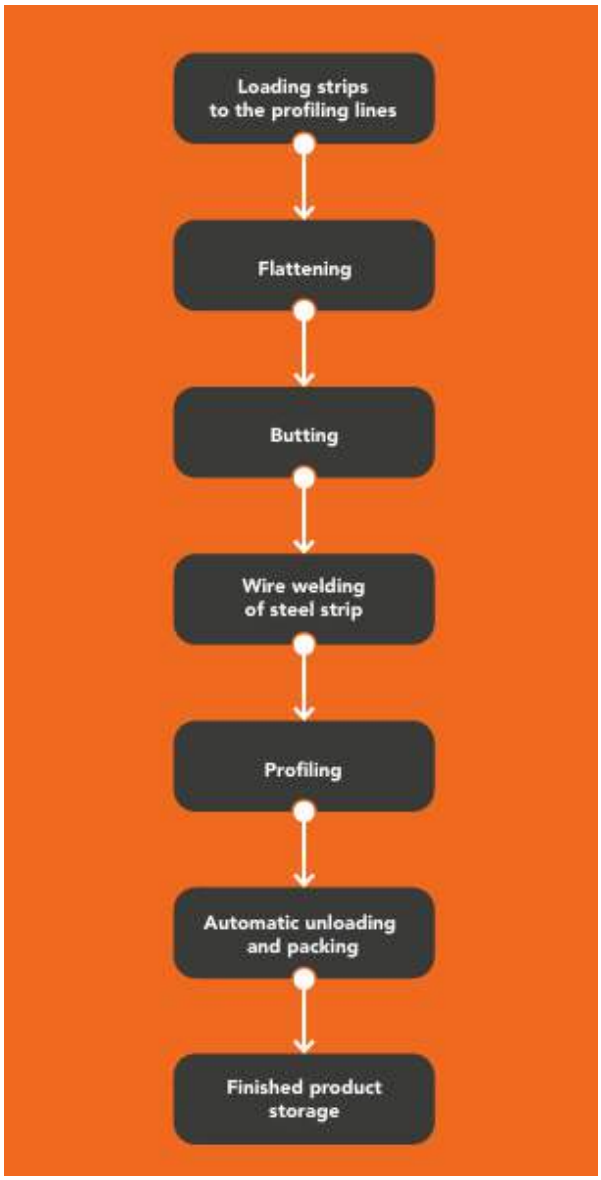
**SPACER PRODUCTION:**

There is a line to produce a particular element of road safety barriers called spacer. The raw material used is essentially constituted by steel strips of the required width. The initial section consists of the decoiler, or the rotating support on which the strips are loaded, to be unrolled and feed the line itself. The machine unwinds the strip, which is subsequently stretched through a compact roller nerveer. A battery of hydraulically operated molds carries out all the drilling according to drawing. Subsequently, a second station carries out the first shaping with subsequent wrapping of the remaining sheet around a core. Finally, automatically, the welding is carried out on the produced. The assembly of the road barrier does not take place in the company but directly at the place of use. The pieces produced are stored in the warehouse or in the external area waiting to be sent to external plants for galvanizing.

**ALLOCATION RULES:**

An allocation was made on a mass basis for energy consumption and waste.

# SYSTEM DIAGRAM



# CONTENT INFORMATION

The average weight of one unit of product, per declared unit, is 30 kg/m. The minimum weight per meter is 20 kg/m and the maximum one is 36 kg/m.

| Product content | Lenght, m | Post-consumer recycled content | Biogenic material, weight-% and kg C/kg |
|---|---|---|---|
| Steel | 1 | 73% | 0 |

| Packaging materials | Weight, kg | Weight-% (versus the product) | Biogenic material, kg C/product or declared unit |
|---|---|---|---|
| Plastic film | 0.011 | 0.06% | 0 |
| Plastic strapping | 0.05 | 0.3% | 0 |

The quantities of such packaging in relation to one ton of final product represent less than 1%.

Electricity information

The electricity used in the manufacturing process of module A3 accounts less than 30% of the GWP-GHG results of modules A1-A3 and the impact of electricity use in the manufactory phases is 0.60 kgCO2 eq/kWh. The electricity has been modelled using the information provided in the AIB report 2025, considering the residual mix of Italy.

Allocation rules

An allocation was made on a mass basis for energy consumption, water discharges, atmospheric emissions and waste.

# MODULES DECLARED

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation:

| | Product stage | | | Construction process stage | | Use stage | | | | | | | End of life stage | | | | Resource recovery stage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Raw material supply | Transport | Manufacturing | Transport | Construction installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling-potential |
| **Module** | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Modules declared | X | X | X | X | X | ND | ND | ND | ND | ND | ND | ND | X | X | X | X | X |
| Geography | GLO | GLO | IT | EU | EU | - | - | - | - | - | - | - | GLO | EU | EU | EU | EU |
| Specific data used | 63.1% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation products | -17%/+16% | | | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation sites | - | | | | | - | - | - | - | - | - | - | - | - | - | - | - |

X = Module considered | ND = Module not declared | GLO = Global | IT = Italy | EU = Europe

## DATA QUALITY

Data quality was assessed in accordance with EN15804+A2 and the General Programme Instructions of the International EPD System (version 5.0.1, Annex A).

Data refer to the same monitoring period and set of EPD Double galvanized guardrails by Marcegaglia Buildtech S.r.l. already publish on EPD International and the data quality requirements are considered to be fulfilled. The products included were designed to be launched on the market in the coming year.

Data have been collected by direct interviews with employers involved in production processes, during specific field-visits in different plant sections or derived from registered company reports. Collected data refer to the monitoring period 2025 calendar year, considered as representative period for all production processes. Secondary representative data refer to the Ecoinvent database v.3.11.

The EPD is based on data collected by Marcegaglia over a one-year period (2025). It is a representation of the production of Double galvanized guardrails.

The EPD incorporates both primary data collected directly from the company and secondary data come from Ecoinvent database. The quality of the data assessed in terms of temporal coverage, geographical, and technological representativeness is rated as very good.

| Life cycle stage | Data contribution to GWP [%] | Geographical representativeness | Temporal representativeness | Technological representativeness |
|---|---|---|---|---|
| A1 Production of steel | 60.2% | Very good | Very good | Very good |

| Process | Source type | Source | Reference year | Data category | Share of primary data, of GWP-GHG results for A1-A3 |
|---|---|---|---|---|---|
| Manufacturing of product | Collected data | EPD owner | 2025 | Primary data | 0.0% |
| Generation of electricity used in manufacturing of product | European Residual Mixes 2024 Association of Issuing Bodies | AIB Version 1.0, 2025-05-30 | 2024 | Primary data | 0.6% |
| Transport of steel to manufacturing site | Database | Ecoinvent v3.11 | 2007/2015 | Primary data | 4.9% |
| Production of steel | EPD Database | EPD Ecoinvent v3.11 | 2025 | Primary data, secondary data | 57.6% |
| Production of packaging | Database Collected data | Ecoinvent v3.11 EPD owner | 2018 | Primary data, secondary data | 0% |
| Total share of primary data, of GWP-GHG results for A1-A3 | | | | | 63.1% |

# ENVIRONMENTAL INFORMATION

The environmental performance indicators refer to 1 linear m of road barrier.

The characterization factors used in this assessment are based on EN 15804+A2 - EF 3.1, which provide a method for quantifying the environmental impact.

## Environmental impact

| Impact category | Abb. | Unit |
|---|---|---|
| Climate change - total | GWP - t | kg $CO_2$ eq |
| Climate change - Fossil | GWP - fossil | kg $CO_2$ eq |
| Climate change - Biogenic | GWP - biogenic | kg $CO_2$ eq |
| Climate change - Land use and LU change | GWP - luluc | kg $CO_2$ eq |
| Climate change - Greenhouse Gases | GWP - GHG | kg $CO_2$ eq. |
| Ozone depletion | ODP | kg CFC11 eq |
| Photochemical ozone formation | POCP | kg NMVOC eq |
| Acidification of land and water | AP | mol H+ eq |
| Eutrophication | EP - freshwater | kg P eq |
| | EP - marine | kg N eq |
| | EP - terrestrial | mol N eq |
| Water use * | WDP | $m^3$ depriv. |
| Resource use, fossils * | ADP - F | MJ |
| Resource use, minerals, and metals * | ADP - MM | kg Sb eq |

** The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.*

## Resource use

| Impact category | Abb. | Unit |
|---|---|---|
| Use of renewable primary energy excluding renewable primary energy resources used as raw materials | PERE | MJ |
| Use of renewable primary energy resources used as raw materials | PERM | MJ |
| Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) | PERT | MJ |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | PENRE | MJ |
| Use of non-renewable primary energy resources used as raw materials | PENRM | MJ |
| Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) | PENRT | MJ |
| Use of secondary material | SM | kg |
| Use of renewable secondary fuels | RSF | MJ |
| Use of non-renewable secondary fuels | NRSF | MJ |
| Use of net fresh water | FW | $m^3$ |

## Waste production

| Impact category | Abb. | Unit |
|---|---|---|
| Hazardous waste disposed | HW | kg |
| Non-hazardous waste disposed | NHW | kg |
| Radioactive waste disposed | RW | kg |

## Output flows

| Impact category | Abb. | Unit |
|---|---|---|
| Reuse | REUSE | kg |
| Materials for recycling | RECYCLE | kg |
| Materials for energy recovery | EN-REC | kg |
| Exported energy-electricity | EE-E | MJ |
| Exported energy-thermal energy | EE-T | MJ |

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| Abb. | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| GWP - t | kg $CO_2$ eq | 5.14E+01 | 3.34E+00 | 8.10E-01 | 1.29E-01 | 8.85E-01 | 2.66E-01 | 1.96E-02 | -1.87E+01 |
| GWP - fossil | kg $CO_2$ eq | 4.85E+01 | 3.34E+00 | 8.10E-01 | 1.29E-01 | 8.84E-01 | 2.56E-01 | 1.96E-02 | -1.86E+01 |
| GWP - biogenic | kg $CO_2$ eq | 2.87E+00 | 9.16E-04 | 1.63E-04 | 2.60E-05 | 5.21E-04 | 8.77E-03 | 9.41E-06 | -3.01E-02 |
| GWP - luluc | kg $CO_2$ eq | 2.26E-02 | 1.43E-03 | 8.29E-05 | 1.32E-05 | 3.18E-04 | 7.64E-04 | 1.12E-05 | -1.19E-02 |
| GWP - GHG | kg $CO_2$ eq | 5.05E+01 | 3.34E+00 | 8.10E-01 | 1.29E-01 | 8.84E-01 | 2.57E-01 | 1.96E-02 | -1.87E+01 |
| ODP | kg CFC-11 eq | 2.33E-07 | 6.07E-08 | 1.20E-08 | 1.92E-09 | 1.93E-08 | 4.28E-09 | 5.45E-10 | -8.99E-08 |
| POCP | kg NMVOC eq | 1.66E-01 | 4.32E-02 | 1.10E-02 | 1.76E-03 | 4.64E-03 | 6.18E-04 | 2.07E-04 | -6.24E-02 |
| AP | mol H+ eq | 2.88E-01 | 5.17E-02 | 7.24E-03 | 1.16E-03 | 2.92E-03 | 1.27E-03 | 1.37E-04 | -8.00E-02 |
| EP - freshwater | kg P eq | 4.32E-03 | 1.76E-04 | 2.60E-05 | 4.16E-06 | 6.23E-05 | 2.36E-04 | 1.71E-06 | -1.10E-02 |
| EP - marine | kg N eq | 5.80E-02 | 1.34E-02 | 3.37E-03 | 5.38E-04 | 9.93E-04 | 2.25E-04 | 5.26E-05 | -1.82E-02 |
| EP - terrestrial | mol N eq | 5.69E-01 | 1.48E-01 | 3.69E-02 | 5.89E-03 | 1.08E-02 | 1.93E-03 | 5.75E-04 | -1.86E-01 |
| WDP | $m^3$ depriv. | 7.68E+00 | 1.84E-01 | 3.06E-02 | 4.88E-03 | 7.34E-02 | 1.37E-01 | 2.13E-02 | -5.77E+00 |
| ADP - F | MJ | 5.33E+02 | 4.43E+01 | 1.05E+01 | 1.68E+00 | 1.29E+01 | 6.00E+00 | 4.80E-01 | -1.97E+02 |
| ADP - MM | kg Sb eq | 2.37E-04 | 7.54E-06 | 2.82E-07 | 4.51E-08 | 2.48E-06 | 5.52E-07 | 2.85E-08 | -1.37E-04 |
| PERE | MJ | 1.49E+01 | 5.55E-01 | 6.61E-02 | 1.06E-02 | 1.99E-01 | 1.36E+00 | 4.48E-03 | -1.96E+01 |
| PERM | 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 |
| PERT | MJ | 1.49E+01 | 5.55E-01 | 6.61E-02 | 1.06E-02 | 1.99E-01 | 1.36E+00 | 4.48E-03 | -1.96E+01 |
| PENRE | MJ | 5.33E+02 | 4.43E+01 | 1.05E+01 | 1.68E+00 | 1.29E+01 | 6.00E+00 | 4.80E-01 | -1.97E+02 |
| PENRM | 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 |
| PENRT | MJ | 5.33E+02 | 4.43E+01 | 1.05E+01 | 1.68E+00 | 1.29E+01 | 6.00E+00 | 4.80E-01 | -1.97E+02 |
| SM | kg | 1.13E+00 | 2.03E-02 | 4.36E-03 | 6.97E-04 | 5.46E-03 | 6.17E-04 | 1.19E-04 | -3.36E+00 |
| RSF | MJ | 9.35E-03 | 1.67E-04 | 1.14E-05 | 1.83E-06 | 7.21E-05 | 2.64E-06 | 2.49E-06 | -2.05E-03 |
| NRSF | 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 |
| FW | $m^3$ | 1.78E-01 | 4.53E-03 | 7.45E-04 | 1.19E-04 | 1.80E-03 | 3.71E-03 | 4.98E-04 | -1.48E-01 |
| HW | kg | 1.47E+00 | 6.16E-02 | 1.18E-02 | 1.89E-03 | 1.89E-02 | 1.30E-02 | 5.46E-04 | -7.44E+00 |
| NHW | kg | 9.09E+01 | 1.14E+00 | 1.72E-01 | 2.75E-02 | 3.85E-01 | 1.16E+00 | 1.26E-02 | -9.99E+01 |
| RW | kg | 2.14E-04 | 9.41E-06 | 1.10E-06 | 1.76E-07 | 3.56E-06 | 4.36E-05 | 6.99E-08 | -1.46E-04 |
| REUSE | 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 |
| RECYCLE | kg | 2.13E-02 | 1.81E-02 | 4.69E-05 | 7.50E-06 | 1.56E-04 | 6.06E-04 | 5.19E-06 | -9.68E-03 |
| EN-REC | kg | 7.13E-05 | 1.96E-06 | 1.50E-07 | 2.39E-08 | 5.71E-07 | 5.14E-08 | 9.23E-09 | -7.67E-05 |
| EE-E | MJ | 1.29E-01 | 5.82E-03 | 4.99E-04 | 7.96E-05 | 2.18E-03 | 2.95E-02 | 3.11E-05 | -5.34E-02 |
| EE-T | MJ | 1.42E+00 | 6.61E-03 | 2.34E-04 | 3.73E-05 | 2.32E-03 | 3.34E-04 | 1.65E-05 | -1.01E-01 |

- Additional impact results for 100% Landfill end-of-life scenarios:

| Abb. | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| GWP - t | kg $CO_2$ eq | 5.14E+01 | 3.34E+00 | 8.10E-01 | 1.29E-01 | 8.85E-01 | 2.66E-01 | 2.23E-01 | 0.00E+00 |
| GWP - fossil | kg $CO_2$ eq | 4.85E+01 | 3.34E+00 | 8.10E-01 | 1.29E-01 | 8.84E-01 | 2.56E-01 | 2.23E-01 | 0.00E+00 |
| GWP - biogenic | kg $CO_2$ eq | 2.87E+00 | 9.16E-04 | 1.63E-04 | 2.60E-05 | 5.21E-04 | 8.77E-03 | 1.07E-04 | 0.00E+00 |
| GWP - luluc | kg $CO_2$ eq | 2.26E-02 | 1.43E-03 | 8.29E-05 | 1.32E-05 | 3.18E-04 | 7.64E-04 | 1.28E-04 | 0.00E+00 |
| GWP - GHG | kg $CO_2$ eq | 5.05E+01 | 3.34E+00 | 8.10E-01 | 1.29E-01 | 8.84E-01 | 2.57E-01 | 2.23E-01 | 0.00E+00 |
| ODP | kg CFC-11 eq | 2.33E-07 | 6.07E-08 | 1.20E-08 | 1.92E-09 | 1.93E-08 | 4.28E-09 | 6.20E-09 | 0.00E+00 |
| POCP | kg NMVOC eq | 1.66E-01 | 4.32E-02 | 1.10E-02 | 1.76E-03 | 4.64E-03 | 6.18E-04 | 2.36E-03 | 0.00E+00 |
| AP | mol H+ eq | 2.88E-01 | 5.17E-02 | 7.24E-03 | 1.16E-03 | 2.92E-03 | 1.27E-03 | 1.56E-03 | 0.00E+00 |
| EP - freshwater | kg P eq | 4.32E-03 | 1.76E-04 | 2.60E-05 | 4.16E-06 | 6.23E-05 | 2.36E-04 | 1.95E-05 | 0.00E+00 |
| EP - marine | kg N eq | 5.80E-02 | 1.34E-02 | 3.37E-03 | 5.38E-04 | 9.93E-04 | 2.25E-04 | 5.99E-04 | 0.00E+00 |
| EP - terrestrial | mol N eq | 5.69E-01 | 1.48E-01 | 3.69E-02 | 5.89E-03 | 1.08E-02 | 1.93E-03 | 6.54E-03 | 0.00E+00 |
| WDP | $m^3$ depriv. | 7.68E+00 | 1.84E-01 | 3.06E-02 | 4.88E-03 | 7.34E-02 | 1.37E-01 | 2.42E-01 | 0.00E+00 |
| ADP - F | MJ | 5.33E+02 | 4.43E+01 | 1.05E+01 | 1.68E+00 | 1.29E+01 | 6.00E+00 | 5.46E+00 | 0.00E+00 |
| ADP - MM | kg Sb eq | 2.37E-04 | 7.54E-06 | 2.82E-07 | 4.51E-08 | 2.48E-06 | 5.52E-07 | 3.24E-07 | 0.00E+00 |

- Additional impact results for 100% Recycling end-of-life scenarios:

| Abb. | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| GWP - t | kg $CO_2$ eq | 5.14E+01 | 3.34E+00 | 8.10E-01 | 1.29E-01 | 8.85E-01 | 2.66E-01 | 0.00E+00 | -2.68E+01 |
| GWP - fossil | kg $CO_2$ eq | 4.85E+01 | 3.34E+00 | 8.10E-01 | 1.29E-01 | 8.84E-01 | 2.56E-01 | 0.00E+00 | -2.67E+01 |
| GWP - biogenic | kg $CO_2$ eq | 2.87E+00 | 9.16E-04 | 1.63E-04 | 2.60E-05 | 5.21E-04 | 8.77E-03 | 0.00E+00 | -4.32E-02 |
| GWP - luluc | kg $CO_2$ eq | 2.26E-02 | 1.43E-03 | 8.29E-05 | 1.32E-05 | 3.18E-04 | 7.64E-04 | 0.00E+00 | -1.71E-02 |
| GWP - GHG | kg $CO_2$ eq | 5.05E+01 | 3.34E+00 | 8.10E-01 | 1.29E-01 | 8.84E-01 | 2.57E-01 | 0.00E+00 | -2.68E+01 |
| ODP | kg CFC-11 eq | 2.33E-07 | 6.07E-08 | 1.20E-08 | 1.92E-09 | 1.93E-08 | 4.28E-09 | 0.00E+00 | -1.29E-07 |
| POCP | kg NMVOC eq | 1.66E-01 | 4.32E-02 | 1.10E-02 | 1.76E-03 | 4.64E-03 | 6.18E-04 | 0.00E+00 | -8.95E-02 |
| AP | mol H+ eq | 2.88E-01 | 5.17E-02 | 7.24E-03 | 1.16E-03 | 2.92E-03 | 1.27E-03 | 0.00E+00 | -1.15E-01 |
| EP - freshwater | kg P eq | 4.32E-03 | 1.76E-04 | 2.60E-05 | 4.16E-06 | 6.23E-05 | 2.36E-04 | 0.00E+00 | -1.58E-02 |
| EP - marine | kg N eq | 5.80E-02 | 1.34E-02 | 3.37E-03 | 5.38E-04 | 9.93E-04 | 2.25E-04 | 0.00E+00 | -2.61E-02 |
| EP - terrestrial | mol N eq | 5.69E-01 | 1.48E-01 | 3.69E-02 | 5.89E-03 | 1.08E-02 | 1.93E-03 | 0.00E+00 | -2.67E-01 |
| WDP | $m^3$ depriv. | 7.68E+00 | 1.84E-01 | 3.06E-02 | 4.88E-03 | 7.34E-02 | 1.37E-01 | 0.00E+00 | -8.29E+00 |
| ADP - F | MJ | 5.33E+02 | 4.43E+01 | 1.05E+01 | 1.68E+00 | 1.29E+01 | 6.00E+00 | 0.00E+00 | -2.83E+02 |
| ADP - MM | kg Sb eq | 2.37E-04 | 7.54E-06 | 2.82E-07 | 4.51E-08 | 2.48E-06 | 5.52E-07 | 0.00E+00 | -1.97E-04 |

# ADDITIONAL LCA RESULTS OF THE PRODUCT

For this EPD, covering the product group “Double sided galvanized guardrails,” variations exceeding 10% have been identified for certain impact categories among the included products. As this EPD does not claim compliance with ISO 21930, such variations are permitted provided they are properly justified and documented.

These differences are primarily due to variations in product composition, in particular the differing weight and quantity of the components forming each barrier. Although the products within the group share the same function and intended application, they may differ in structural configuration (e.g. dimensions, or additional components), which directly influences the environmental impact results. The observed deviations therefore reflect actual and justified differences in the physical characteristics of the products.

The grouping of these products within a single EPD is considered appropriate, as they belong to the same functional family and are representative of the same application. Variations above 10% are therefore justified and transparently reported in the LCA results, in accordance with the applicable EPD requirements.

| LCA result of one declared unit product (A-C) | Unit | Min | Max |
|---|---|---|---|
| GWP - t | kg CO2 eq | -16% | 16% |
| GWP - fossil | kg CO2 eq | -16% | 16% |
| GWP - biogenic | kg CO2 eq | -15% | 15% |
| GWP - luluc | kg CO2 eq | -2% | 3% |
| GWP - GHG | kg CO2 eq | -17% | 16% |
| ODP | kg CFC11 eq | -18% | 18% |
| POCP | kg NMVOC eq | -19% | 18% |
| AP | mol H+ eq | -19% | 19% |
| EP - freshwater | kg P eq | -31% | 31% |
| EP - marine | kg N eq | -19% | 18% |
| EP - terrestrial | mol N eq | -19% | 19% |
| WDP | m3 depriv. | -10% | 9% |
| ADP - F | MJ | -15% | 14% |
| ADP - MM | kg Sb eq | -12% | 12% |

# ADDITIONAL ENVIRONMENTAL INFORMATION

The steel used has an average recycled content of 73%: this percentage is calculated as a weighted average of the incoming raw material. The steel supplies come from blast furnace (with an average recycled content of 16.6%) or from an electric arc furnace (with an average recycled content of 81.5%).

Regardless of the type of product considered, the element that most affects the final result is the purchased steel.

It should be noted that at the end of its useful life, once the road barrier has been disassembled it is destined for recycling. The 88.8% of the steel recovered is intended for recycling, the value is consistent with the report released by ISPRA in 2025: “Rapporto rifiuti speciali” di ISPRA – n° 416/2025.

The products do not contain hazardous substances from the SVHC Candidate List for Authorization in quantities greater than 0.1%.

# VERSION HISTORY

Original version of the EPD, 2026-07-20.

# ABBREVIATIONS

| Abbreviation | Definition |
|---|---|
| EN | European Norm (Standard) |
| GPI | General Programme Instructions |
| ISO | International Organization for Standardization |
| CEN | European Committee for Standardization |
| CPC | Central product classification |
| SVHC | Substances of Very High Concern |
| ND | Not Declared |
| D | Declared |

# REFERENCES


- General Programme Instructions of the International EPD® System. Version 5.0.1;
- PCR 2019:14 Construction products (EN 15804+A2) vers. 2.0.1 (2025-06-05) ;
- c-PCR-010 (TO PCR 2019:14) Guardrails and bridge parapets, 2019:14, version 1.0.1;
- Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012;
- Ecoinvent database v.3.11 – April, 2025;
- ISO 14025: 2010 “Environmental labels and declarations - Type III environmental declarations - Principles and procedures”;
- ISO 14040:2021 “Environmental management - Life cycle assessment - Principles and framework”;
- ISO 14044:2021 “Environmental management - Life cycle assessment - Requirements and guidelines”;
- ISO 15804:2021 “Sustainability of buildings - Environmental product declarations - Development framework rules by product category”;
- European Residual Mixes 2024 Association of Issuing Bodies “European Residual Mixes Results of the calculation of Residual Mixes for the calendar year 2024” – 2025-05-30;
- Environmental engineering "WASTE FROM CONSTRUCTION AND LCA DEMOLITION FROM THE DEMOLITION OF 51 RESIDENTIAL BUILDINGS" - Michele Paleari, Politecnico di Milano – 26-11-2015;
- ISPRA in 2025: “Rapporto rifiuti speciali” di ISPRA – n° 416/2025;
- Internal LCA Study “Not Yet On the Market_Barriers_Rev1” – May 2026.




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