ENVIRONMENTAL PRODUCT DECLARATION
as per /ISO 14025/ and /EN 15804/

| Owner of the Declaration                       | bauforumstahl e.V. & Industrieverband Feuerverzinken e.V. |
| Programme holder                               | Institut Bauen und Umwelt e.V. (IBU)                        |
| Publisher                                      | Institut Bauen und Umwelt e.V. (IBU)                        |
| Declaration number                             | EPD-BFS-20180167-IBG1-EN                                   |
| Issue date                                     | 21.12.2018                                                 |
| Valid to                                       | 20.12.2023                                                 |

Hot-dip galvanized structural steel:
Hot rolled steel sections and heavy plates
bauforumstahl e.V. &
Industrieverband Feuerverzinken e.V.

www.ibu-epd.com / https://epd-online.com
1. **General Information**

<table>
<thead>
<tr>
<th>Programme holder</th>
<th>Hot-dip galvanized structural steel: Hot rolled steel sections and heavy plates</th>
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<td>bauformumstahl e. V. &amp; Industrieverband Feuerverzinken e.V.</td>
<td>Owner of the declaration</td>
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<td>I B U - Institut Bauen und Umwelt e.V.</td>
<td>bauformumstahl e. V.</td>
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<tr>
<td>Panoramastr. 1, 10178 Berlin Germany</td>
<td>Sohnstr. 65, 40237 Düsseldorf Germany</td>
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<th>Declared product / declared unit</th>
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<tr>
<td>EPD-BFS-20180167-IBG1-EN</td>
<td>The declared unit is 1 t of structural steel (sections and plates)</td>
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| This declaration is based on the product category rules: |
| Structural steels, 07.2014 |

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<tr>
<th>Issue date</th>
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Scope:
This environmental product declaration covers hot-dip galvanized structural steel rolled out to structural sections, merchant bars and heavy plates, intended for bolted, welded or otherwise connected constructions in buildings, bridges and similar structures. The precursor products are heavy plates and rolled steel sections that are subsequently hot-dip galvanized.

The heavy plates are produced by:
- Dillinger, operating sites at Dillingen (Germany) and Dunkirk (France)
- ArcelorMittal, operating sites at Differdange (Luxembourg), Dabrowa (Poland), Esch-Belval (Luxembourg), Bergara (Spain), Hunedoara (Romania), Oliaberra (Spain), Warsaw (Poland) and Rodange (Luxembourg)
- Peiner Träger (Germany)
- Stahlwerk Thüringen (Germany)

The hot rolled sections are produced by:
- Differdange (Luxembourg), Dabrowa (Poland), Esch-Belval (Luxembourg), Bergara (Spain), Hunedoara (Romania), Oliaberra (Spain), Warsaw (Poland) and Rodange (Luxembourg)
- Peiner Träger (Germany)

The products are hot-dip galvanized under subcontracting agreements and by the member companies and partners of the German Association for Hot-Dip Galvanizing (Industrieverband Feuerverzinken e.V. IVF, see https://www.feuerverzinken.com/industrie/mitglieder-und-partner). For the selection of the hot-dip galvanizing contractors for the purpose of data collection, the plant size, galvanizing capacity and product range were taken into account. With regard to the scope of the EPD, the data thus covers a representative sample.

The owner of the declaration shall be liable for the underlying information and evidence; IBU shall not be liable with respect to manufacturer information, life cycle assessment data and requisite evidence.

Verification

| The standard /EN 15804/ serves as the core PCR |
| Independent verification of the declaration and data according to /ISO 14025:2010/ |

| internally | externally |

Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)
Dr. Alexander Röder (Managing Director IBU)
Dr.-Ing. Wolfram Trinius (Independent verifier appointed by SVR)
2. Product

2.1 Product description / Product definition
This EPD applies to 1 t of hot-dip galvanized structural steel (sections and plates). It covers steel products of grades S235 to S960 rolled out to structural sections, merchant bars and heavy plates. The primary data relating to the production of the steel products is taken from EDP /Structural steel: Sections and Plates/ published by bauforumstahl e.V. For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland), Regulation (EU) No. 305/2011 (CPR) applies. The product needs a declaration of performance taking into consideration /EN 10025:2005-2 Hot rolled products of structural steels/ and a CE mark.

2.2 Application
Hot-dip galvanized structural steel is used for bolted, welded or otherwise connected constructions in buildings, bridges and similar structures, and in composite steel structures. Examples:
- Single-storey buildings (industrial and storage halls, etc.)
- Multi-storey buildings (office, residential buildings, shops, car parks, high rise, etc.)
- Bridges (railway, road and pedestrian bridges, etc.)
- Other structures (power plants, stadiums, convention centres, airports, train stations, etc.)
- Industrial plants.

2.3 Technical Data
This EPD applies to sheet metal and rolled sections of various steel grades and shipping formats that have been hot-dip galvanized according to /DIN EN ISO 1461/ and /DASt Guideline 022/. For specific dimensional tolerances, construction and strength data as well as mechanical and chemical properties, refer to the relevant literature and/or standards, including /EN 1993/.

The performance data of the product correspond to the declaration of performance with regard to its characteristic properties according to /EN 10025 Hot rolled products of structural steels/.

Constructional data

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
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<tbody>
<tr>
<td>Density</td>
<td>7850</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Modulus of elasticity</td>
<td>210000</td>
<td>N/mm²</td>
</tr>
<tr>
<td>Coefficient of thermal expansion</td>
<td>12</td>
<td>10⁶K⁻¹</td>
</tr>
<tr>
<td>Thermal conductivity at 20°C λ</td>
<td>48</td>
<td>W/(mK)</td>
</tr>
<tr>
<td>Melting point depending on the alloy proportions up to</td>
<td>1536</td>
<td>°C</td>
</tr>
<tr>
<td>Shear modulus</td>
<td>81000</td>
<td>N/mm²</td>
</tr>
<tr>
<td>Emissivity up to 500 °C / from 500 °C</td>
<td>0,35 /</td>
<td>0,7</td>
</tr>
</tbody>
</table>

Other product standards: /ASTM A36/, /A572/, /A992/, /A913/, /A283/, /A514/, /A573/, /A588/, /A633/, /A709/ and /A1066/.

2.4 Delivery status
The dimensions of the declared products may vary depending on the intended application.

2.5 Base materials / Ancillary materials
Structural steels are non- or low-alloy steel products whose carbon content is between 0 and 0.6%. Iron is the main component of steel sections and plates. The content of other elements is significantly lower.

The chemical composition varies from steel grade to steel grade and is specified in the product standards listed below. The surfaces of hot-dip galvanized structural steels are covered by a zinc coating.

Auxiliary materials:
A. For production route "blast furnace with basic oxygen furnace": coking coal, coal, lime
B. For production route "electric arc furnace": lime For both production routes: aluminium, ferro alloys (ferro silicon, ferro manganese, ferro nickel, ferro niobium, ferro vanadium, ferro titanium)
The content in weight percent of these additives depends on the steel grade.
C. For hot-dip galvanizing: degreasing agent, hydrochloric acid, zinc and ammonium chloride, zinc alloy

2.6 Manufacture
In the integrated steel production route "blast furnace with basic oxygen furnace" (integrated steel production), iron ore, (typical mix based on ferric oxide Fe₂O₃), coke breeze, circulating components and other additives are mixed and sintered in preparation for being fed into the blast furnace together with coking coke, which is the reducing agent. Also pellets and/or lump ore may be used. The pig iron produced in the blast furnace is transferred to the basic oxygen furnace. In this vessel, the iron is converted into steel by lowering the carbon content of the iron by blowing oxygen into the melt (exothermic reaction). For temperature control, scrap (up to 35%) is added to the melt.

In the electric steel production route, scrap is molten in an electric arc furnace to obtain liquid steel. Refining (lowering of sulphur, phosphorous and other tramp elements) and alloying (e.g. about 1% Mn, 0.2% Si) and / or micro-alloying (e.g. about 0.01% V) are applied to give the steel the required characteristics. At the end of the steelmaking process, the liquid steel is processed in a continuous casting machine to a semi-finished product. In exceptional cases, it is poured into ingot moulds to form blocks.

The semi-finished product (slab, beam blank, bloom or billet) is hot-rolled into the final product shape (heavy plate, wide flat, H-shape, I-shape, U-shape, L- shape and other merchant bars).

Quality control: /ISO 9001/ Monitoring according to the relevant product standards, e.g. /EN 10025, Part 1/.

Subsequently, the products are hot-dip galvanized. For this purpose, they undergo a wet chemical surface cleaning, are covered by flux, dried and then dipped in a hot zinc bath and cooled /Peissker 2016/. Quality assurance: /ISO 9001/ monitoring according to /DASt Guideline 022/.
2.7 Environment and health during manufacturing
No measures relating to safety, health and environment protection during the manufacturing process extending beyond statutory regulations are required.

2.8 Product processing/Installation
Processing recommendations:
Planning, processing, implementation and intended use of section and plate constructions have to be carried out depending on the respective applications, and according to the generally recognized rules of engineering and manufacturer recommendations.

Standards /EN 1993/ and /EN 1994/ (/EUROCODE EC3/ and /EC4/) apply to the design of steel structures and composite steel and concrete structures. They specify the requirements regarding serviceability, bearing capacity, durability and fire resistance of steel structures /EC3/ and composite steel and concrete structures /EC4/. Parts 1-2 of /EN 1090/ apply to the production of steel structures and include the requirements for factory production control.

The European standards are complemented by national appendices, instructions, guidelines and publications, as well as statutory regulations.

For the transport and storage of sections and plates, the generally accepted requirements for securing loads must be observed.

Instructions and recommendations of the manufacturer, based on relevant standards and guidelines for welding, galvanizing as well as hot and cold forming must always be observed.

Occupational safety / Environmental protection:
When processing/using steel sections and plates pursuant to the generally recognized rules of engineering, there is no need for measures that go beyond the statutory health and safety regulations.

The processing/use of steel sections and plates pursuant to the generally recognized rules of engineering does not lead to the release of substantial environmental pollutants.

Specific measures to protect the environment are not required.

Residual material:
During processing, cut-off and other waste as well as chips produced by cutting must be collected separately.

The steel scrap can be nearly 100% recycled by melting to produce new steel products, while the recovered zinc can be used again for hot-dip galvanizing.

2.9 Packing
Hot-dip galvanized structural steels are normally shipped without packaging. To facilitate transportation, the material is generally made available in bundles.

For sea transport, special packaging to protect the goods while at sea might be used.

2.10 Condition of use
Chemical composition:
Hot-dip galvanized structural steels are non- or low-alloy steel products produced by alloying iron with other metals and non-metals (especially carbon). Iron is the main component of steel sections and heavy plates. During usage, the chemical composition remains the same as at the time of production (see chapter 2.6).

2.11 Environment and health during use
If used properly, there are no known negative impacts of hot-dip galvanized heavy plates and rolled steel sections on the environment or on the health of people.

2.12 Reference service life
Hot-dip galvanizing allows for durable corrosion protection of steel components under atmospheric corrosion conditions. The protection normally lasts for several decades without any need for maintenance or repair.

The product meets the requirements of building material safety class A1 (non-flammable according to /DIN EN 13501/).

Given the significantly lower emissivity of hot-dip galvanized structural steel, and depending on the form factor, fire resistance class R30 can be achieved by hot-dip galvanizing alone and without any additional protective measures.

At temperatures above 650°C, the thin zinc coating evaporates quickly as zinc oxide (ZnO), causing fumes.

When inhaled for a prolonged period of time, ZnO fumes can cause metal fume fever (diarrhoea, fever, dry throat), whereby these symptoms normally disappear within 1 to 2 days after inhalation.

The critical temperature (failure temperature of the material) is 670°C or 710°C for carbon steel.

Fire safety
Designation according to DIN EN 13501-1

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<tbody>
<tr>
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</table>

Water
Hot-dip galvanized steel is not soluble in water and does not release any substances when exposed to water.

Mechanical destruction
Due to the high ductility of steel, structures made from hot-dip galvanized steel react resilient in the event of unforeseeable mechanical destruction:
Under tensile load, structural steel is deformed by necking, with fracture at high loads. Under constant high compressive load, components made from hot-dip galvanized steel might buckle. Splintering, chipping, etc. do not occur.

2.14 Re-use phase

General:
Sections and plates of hot-dip galvanized steel are recyclable by 100%.
Due to the magnetic properties of steel, 99% of the used steel is recovered after dismantling. /European Commission Technical Steel Research/.

Recycling:
After dismantling, hot-dip galvanized sections and plates can be recycled without any problems. Currently, around 88% of the products are recycled as material.
Sources: /European Commission Technical Steel Research/ and /German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety/. The remaining 11% (99% - 88%) is re-used.

Re-use:
Sections and plates can be re-used. Currently, around 11% of the products are re-used after dismantling.

2.15 Disposal

Due to its high value as a resource, steel scrap is not disposed of in landfill but enters a well-established cycle of re-use or recycling. Should it however be disposed of in landfill, for instance due to collection loss, no environmental impacts are to be expected. Waste code according to European Waste Catalogue /EWC/: (17 04 05 - iron and steel)

2.16 Further information

For more information on hot-dip galvanized structural steel and its use, visit www.bauforumstahl.de and www.feuerverzinken.com.

3. LCA: Calculation rules

3.1 Declared Unit
The declaration refers to the functional unit of 1 ton of hot-dip galvanized structural steel: rolled sections and heavy plates.
The LCA is calculated based on weighted average production volumes of representative plants.

Declared unit

<table>
<thead>
<tr>
<th>Designation</th>
<th>Value</th>
<th>Unit</th>
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<tbody>
<tr>
<td>Declared unit</td>
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<td>t</td>
</tr>
<tr>
<td>Specific weight</td>
<td>7850</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Conversion factor for 1 kg</td>
<td>0.001</td>
<td>-</td>
</tr>
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</table>

3.2 System boundary
EPD type: Cradle-to-gate - with options.
The following processes are included in product stage A1–A3 of the hot-dip galvanized steel:

- Manufacturing processes involving raw materials/semi-finished goods (module A1) and auxiliary materials (module A3).
The manufacturing process for structural steel is based on EPD "Structural steel – hot rolled steel sections and heavy plates" as revised in 2018.
- Transport of structural steel to galvanizing plant (module A2)
- Hot-dip galvanizing of structural steel (module A3), including energy generation, production of auxiliary materials, disposal of waste material (production waste, precursor packaging waste) and emissions produced by plant.

Module C3 takes into account the sorting and shredding of after-use steel that is recycled, as well as non-recovered scrap resulting from sorting loss, which is disposed of in landfill. A conservative estimate of 1% landfill is assumed.

Module D refers to the end-of-life re-use and recycling of structural steel.

3.3 Estimates and assumptions
For the transport analysis, a transport distance of 100 km has been assumed, unless otherwise specified by the relevant companies.
The model is based on the general use of a degreasing agent (based on hydrochloric acid or sodium hydroxide) in all cases and thus represents the worst case scenario.
The heat generated by the incineration of the packaging of raw and auxiliary materials is used to generate electricity and thermal energy.
According to the /Product Category Rules PCR part A/, the generated energy is set off against the energy consumed in the production of structural steel (A1–A3). Steel scrap from production is set off against the "recycling potential for sheet steel". The spent iron pickling and zinc baths are partially recycled so that 30% of the input material can be set off. In order to assess the impact of the recycling rates on the environmental profile of the product, a sensitivity analysis was performed, using three scenarios with recycling rates of 0 %, 30 % and 70 % respectively. This analysis showed that the above assumptions are accurate.

3.4 Cut-off criteria
All data gathered during the production data acquisition, as well as the consumption data for thermal energy, electricity and diesel are taken into account.
All material flows that amount to more than 1 % of the total mass, the energy consumption or the environmental impact of the system have been taken into account in the analysis. It can be assumed that the processes omitted from the analysis account for less than 5% of the impact within the relevant categories.
Impacts relating to the production of machines, plants and facilities required for production are outside the scope of this assessment.

3.5 Background data
For the life cycle modelling of the declared products, the "GaBi 8" software system for life cycle engineering was used (/GaBi ts Software/).
All relevant background datasets relating to the production of hot-dip galvanized structural steel were retrieved from the GaBi 8 database, or were made available by bauforumstahl e.V. and Industrieverband Feuerverzinken e.V.

The representative hot-dip galvanizing contractors were identified by Industrieverband Feuerverzinken /Hot-dip galvanized structural steel/.

### 3.6 Data quality

All relevant background datasets for the LCA were retrieved from the GaBi 8 database. Primary data was made available by bauforumstahl e.V. and Industrieverband Feuerverzinken e.V. The quality of the data is considered high. The last revision of the used background and manufacturer data took place less than 5 years ago.

### 3.7 Period under review

The data used for this LCA is based on up-to-date primary data collected by bauforumstahl e.V. and Industrieverband Feuerverzinken e.V. in 2017.

### 3.8 Allocation

The spent pickling and flux baths are partially recycled. A recovery rate of the input material of 30% for set-off was assumed for the worst case scenario. For the steel and zinc scrap generated in the production process, the relevant amounts of primary materials minus the impacts associated with the related preparation and melting processes have been credited.

### 3.9 Comparability

As a rule, a comparison or evaluation of EPD data is only possible, if all datasets to be compared are compiled according to /EN 15804/, and the building construction context or the product-specific characteristics of performance are taken into account.

## 4. LCA: Scenarios and additional technical information

The following end-of-life scenarios for re-use, recycling and waste disposal were assessed:

### End of life (C3)

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<tbody>
<tr>
<td>Landfill disposal</td>
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### Reuse, recovery and/or recycling potential (D)

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<tr>
<td>Recycling</td>
<td>88</td>
<td>%</td>
</tr>
<tr>
<td>Reuse</td>
<td>11</td>
<td>%</td>
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</table>
5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 ton structural steel

RESULTS OF THE LCA - RESOURCE USE: 1 ton structural steel

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 ton structural steel

6. LCA: Interpretation

This chapter summarises the results of the LCA.

The production of the raw material (module A1) is the largest impact driver across all declared modules (with the exception of ODP, which is mainly caused by energy generation), followed by module A3.

The contributions of the transport of the structural steel (module A2) and waste treatment (module C3) are below 1.5% in all environmental impact categories. The credits in module D arise from the recycling of steel scrap.

The credit is based on the substitution of primary steel by secondary steel from the electric arc furnace (EAF), with a 100% scrap utilisation along the EAF route.

The figure below illustrates the outcomes of the modules relative to modules A1-A3 for selected environmental criteria.
Global Warming Potential (GWP), Acidification Potential (AP), Eutrophication Potential (EP), Photochemical Ozone Creation Potential (POCP) and Abiotic Depletion Potential fossil fuel (ADPF) are dominated by the emissions arising during steel production and the manufacture of auxiliary and precursor materials, as the steel production is an energy-intensive process. The second highest impact is caused by the mining and processing of the raw materials, and by the generation of steam and heat.

The provision of zinc is the main contributing factor to the Abiotic Depletion Potential elementary (ADPe). The results for Ozone Depletion Potential (ODP) are mainly due to upstream energy generation processes, in particular the generation of nuclear energy. In this EPD model, the share of nuclear energy for the generation of electric power for modules A1-A3 is very small, which is reflected in the low value for A1-A3.

In contrast, module D is based on the global average steel production mix, where the share of nuclear power is much higher. As a consequence, the ODP results are mainly due to module D.

The figure below compares the relative contributions of the production of structural steel on the one hand and of hot-dip galvanizing on the other. The values refer exclusively to modules A1-A3 and do not include credits. They show clearly that the hot-dip galvanizing process contributes only marginally to the environmental impact of the overall process. When assessing the hot-dip galvanizing process in isolation, the processes for the provision of the zinc and the thermal and electrical energy are the main contributing factors.
7. Requisite evidence

7.1 Chemical weathering
When exposed to the elements, the surfaces of hot-dip galvanized steel components become naturally covered in a protective layer known as patina. Patina is extremely durable and thus provides for exceptionally effective protection against corrosion, lasting several decades. At the same time, it protects the zinc coating, so that it remains intact for a long period of time. The ever more stringent air quality improvement measures (in particular the desulphurisation of power plant and engine fuels) have a major positive impact on the reduction of chemical weathering of zinc coatings. /Schröder 2013/ reports of zinc coating depletion rates of up to 4.7 µm/a observed in the 1970s in hot-dip galvanized steel crash barriers. For complete chemical weathering, recent publications (see /Hullmann 2003/) quote corrosion rates for zinc of 3.0 g/m²/a (corresponding to approx. 0.5 µm/a). Recent studies (/BAST 2008/ and /Schröder 2013/) examined hot-dip galvanized steel crash barriers along the German Federal Motorway BAB 4 and detected no measurable loss of thickness of the zinc coating due to chemical weathering after 10 years of exposure to the elements. Chemical weathering can thus be assumed to be minimal and therefore negligible, even over several years and under increased corrosion stress such as along motorways (where deicing salt is used during the winter months).

8. References

/IBU 2016/
IBU (2016): General Programme Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt e.V., Version 1.1 Institut Bauen und Umwelt e.V., Berlin

/ISO 14025/
DIN EN /ISO 14025:2011-10/, Environmental labels and declarations — Type III environmental declarations — Principles and procedures

/EN 15804/
/EN 15804:2012-04+A1 2013/, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

BAST 2008, Coil-coated safety rails; German Federal Highway Research Institute (BAS) Bergisch-Gladbach 2008


**ASTM A709:211,** Standard Specification for Structural Steel for Bridges

**ASTM A913:2007,** Standard specification for high-strength low-alloy steel shapes of structural quality, produced by quenching and self-tempering process (QST)

**ASTM A992:2011,** Standard specification for structural steel shapes

**ASTM A1066:2011,** Standard Specification for High-Strength Low-Alloy Structural Steel Plate Produced by Thermo-Mechanical Controlled Process (TMCP)

**Environmental Product Declaration bauforumstahl e.V. & Industrieverband Feuerverzinken e.V.,** Structural Steel: Sections and Plates – ENVIROMENTAL PRODUCT DECLARATION, bauforumstahl e.V., 2018

**Feuerverzinker Baustahl,** Festlegung repräsentativer Feuerverzinkungsunternehmen durch den Industrieverband Feuerverzinken e.V.

**European Commission Technical Steel Research,** ECSC project: LCA for steel construction – Final report EUR 20570 EN; February 2002; The Steel Construction Institute

**Standards and regulations:**

**ASTM A 36:2008,** Standard specification for carbon structural steel


**ASTM A514:2009,** Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding

**ASTM A572:2012,** Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel


**ASTM A709:211,** Standard Specification for Structural Steel for Bridges

**ASTM A913:2007,** Standard specification for high-strength low-alloy steel shapes of structural quality, produced by quenching and self-tempering process (QST)

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**CEN/TR 15941:2010-03:** Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data


**EN 1090:2012,** Execution of steel structures and aluminium structures

**DIN EN ISO 1461:2009,** Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods

**DIN EN 1993:2010-12,** Eurocode 3: Design of steel structures

**DIN EN 1994:2010-12,** Eurocode 4: Design of composite steel and concrete structures

**DIN EN ISO 9001:2015-11,** Quality management systems - Requirements

**DIN EN ISO 9223:2012-05** Corrosion of metals and alloys - Corrosivity of atmospheres - Classification, determination and estimation

**EN 10025:2005-2,** Hot rolled products of structural steels

**EN 13501:2010-1,** Fire classification of construction products and building elements

**DIN EN ISO 14001:2015-11,** Environmental management systems - Requirements with guidance for use

**DIN EN ISO 14025:2018-09,** Environmental labels and declarations - Type III environmental declarations - Principles and procedures

**DIN EN ISO 14040:2009-11,** Environmental management - Life cycle assessment - Principles and framework


**DIN EN ISO 14713-1:2017** Zinc coatings - Guidelines and recommendations for the protection against corrosion of iron and steel in structures – Part 1: General principles of design and corrosion resistance
General Information

<table>
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<tr>
<th>bauforumstahl e.V.</th>
<th>(Hot dip galvanized) Structural Steel: Sections and Plates</th>
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<td><strong>Owner of the Annex</strong></td>
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<tr>
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<tr>
<td>EPD-BFS-20180167-IBG1-EN</td>
<td>This environmental product declarations cover blank and hot-dip galvanized steel products rolled out to structural sections, merchant bars and heavy plates, intended for bolted, welded or otherwise connected constructions of buildings, bridges and other structures. This environmental product declaration are valid for the following products: Heavy Plates produced by: - Dillinger with the sites in Dillingen (Germany) and Dunkirk (France) Hot rolled sections produced by: - ArcelorMittal on the sites Ostrava (Czech Republic), Differdange (Luxembourg), Dabrowa (Poland), Esch-Belval (Luxembourg), Bergara (Spain), Hunedoara (Romania), Olaberria (Spain), Warszawa (Poland) and Rodange (Luxembourg) - Peiner Träger (Germany) - Stahlwerk Thüringen (Germany) Hot-dip galvanizing of the structural steel is done by the member and partner companies of the Industrieverband Feuerverzinken e.V. The production shares in this EPD are 30% Basic Oxygen Furnace route (primary steel production) and 70% Electric Arc Furnace route (secondary steel production) based on the total yearly production volume. The data used represent &gt;95% of the annual production of sections and plates from all bauforumstahl member companies.</td>
</tr>
<tr>
<td>EPD-BFS-20180167-IBG1-DE</td>
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<tr>
<td>EPD-BFS-20180116-IBG2-DE</td>
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<td>EPD-BFS-20180116-IBG2-EN</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>This Annex is based on an Environmental Product Declaration:</strong></th>
<th><strong>LEED rating system and Version</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural steel, 10-2018</td>
<td>LEED v4</td>
</tr>
<tr>
<td>Hot dip galvanized structural steel, 12-2018</td>
<td></td>
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<tr>
<td>(EPDs verified independently)</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Issue date</strong></th>
<th><strong>Valid to</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>2023</td>
</tr>
</tbody>
</table>
Product

Product description
1 t of structural steel (sections and plates). It covers steel products of the grades S235 to S960 rolled out to structural sections, merchant bars and heavy plates.

Application
Structural steels are intended for bolted, welded or otherwise connected constructions of buildings, bridges and other structures, or in composite steel and concrete structures.
Examples:
- single storey buildings (industrial and storage halls, etc.)
- multistorey buildings (offices, residential buildings, shops, car parks, high rise, etc.)
- bridges (railway bridge, road bridge, pedestrian bridge, etc.)
- other structures (power plants, stadiums, convention centers, airports, stations, etc.)

LEED - Materials and Recourses (MR)

MR Credit 4: Recycled Content

List of waste materials during construction

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total weight of the product</td>
<td>1000</td>
<td>kg</td>
</tr>
<tr>
<td>Postconsumer recycled content</td>
<td>72</td>
<td>%</td>
</tr>
<tr>
<td>Pre-consumer recycled content</td>
<td>12.4</td>
<td>%</td>
</tr>
</tbody>
</table>

MR Credit 4: Recycled Content

Relevant for:
Every product.

Requirements:
Certified Report encouraged but not yet required: Indication of the recycled content distinct to Post- and Pre-consumer recycled content.

Target on building level:
10-20% recycled content based on total costs of the building.

Info:
MR Credit 4: 1-2 points
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