

ENVIRONMENTAL-PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A1

Owner of the Declaration	ArcelorMittal Europe – Flat Products
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Valid to	24.07.2024

Hot dip galvanized steel with pure Zinc coating
ArcelorMittal

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EPD
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General Information

ArcelorMittal

Programme holder

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Declaration number

EPD-ARM-20170139-IBD2-EN

This declaration is based on the product category rules:

Structural steels, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

25.01.2019

Valid to

24.07.2024



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(chairman of Institut Bauen und Umwelt e.V.)



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Hot dip galvanized steel with pure Zinc coating

Owner of the declaration

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Declared product / declared unit

The declared unit is 1 metric ton of zinc coated steel.
(1mm steel thickness with 275 g/m² pure zinc metallic coating)

Scope:

The Life Cycle Assessment is based on data collected from the ArcelorMittal plants producing zinc coated steel, representing 100% of the production in 2016. 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+A1. In the following, the standard will be simplified as *EN 15804 bezeichnet*.

Verification

The standard EN 15804 serves as the core PCR	
Independent verification of the declaration and data according to ISO 14025:2011	
<input type="checkbox"/>	internally
<input checked="" type="checkbox"/>	externally



Mr Carl-Otto Neven,
(Independent verifier)

Product

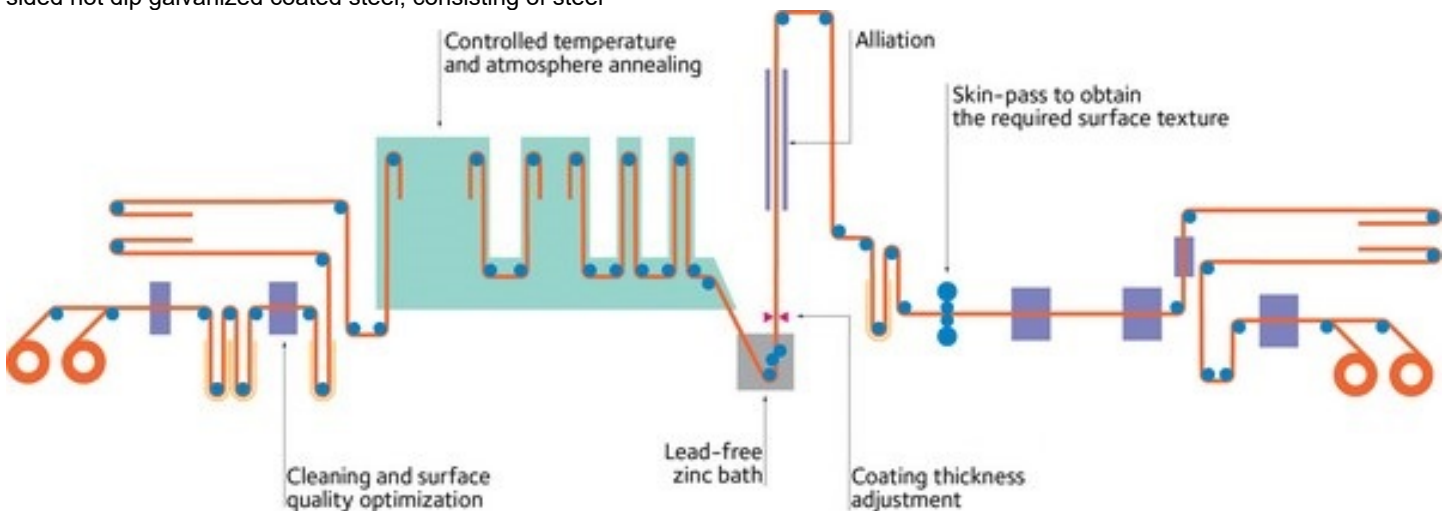
Product description/Product definition

The declared products must be described.

In addition to a general product description, the trade names of the products/product groups (including any product codes) must be mentioned to which the EPD applies.

If the declaration of trade names is not meaningfully possible (e.g. in the context of association EPDs), the product description must clearly demarcate the products product groups to which the EPD applies.

This Environmental Product Declaration refers to a double-sided hot dip galvanized coated steel, consisting of steel



substrate with a metallic pure zinc coating applied by means of a continuous hot dip galvanising process:

Zinc coated steels are described according to /EN 10346:2015/, with the possible steel substrates (Low carbon steels, steels for construction, steel for cold forming), possible coating types and coating masses. In the case of this EPD, only the pure zinc coating is considered ('Z' symbol).

Application

Zinc coated steels are used in a very wide range of applications for industrial markets and for construction markets both indoor and outdoor applications.

Some of the most common applications are:

- Building: wide sections for roofing and cladding, doors & windows, door frames, metallic ceilings, partitions, structural members, etc.
- Domestic appliances (white and brown goods)
- Tubular applications
- Electrical equipment (electrical cabinets, cable trays ...)
- Heat & Ventilation equipment, air conditioners, road signals etc.

Zinc coated steels are delivered in wide coils, slit coils or sheets ready to be processed through various technologies: bending, roll forming,

drawing, welding, perforating & cutting, painting, etc.

Technical Data

Hot dip galvanised products offer excellent corrosion resistance combined with very good forming properties. The coating process can apply various thickness of the zinc layer, up to 725 g/m² (total of both sides). Specific mechanical properties are defined for each steel grade used as substrate and measured according to /EN ISO 6892/. The corrosion resistance performance can be evaluated with different indoor & outdoor tests. One of the most common tests is the 'Salt Spray Test' defined according to /EN ISO 9227/. Please select one of the following options and delete the header of the selected [alternative]:

[Alternative 1a: Product according to the CPR, based on a hEN]:

- Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN xyz:date, title*.
- Voluntary data: *source, date, title* (not part of CE-marking).

[Alternative 1b: Product according to the CPR, based on an ETA]:

- Performance data of the product in accordance with the declaration of performance with respect to its essential



characteristics according to *ETA no. xyz, date, title*.

- Voluntary data: *source, date, title* (not part of CE-marking).

[Alternative 2a: Product not harmonised in accordance with the CPR but in accordance with other provisions for harmonisation of the EU]:

Performance data of the product according to the harmonised standards, based on provisions for harmonization.

Voluntary data: *source, date, title* (not part of CE-marking).

[Alternative 2b: Product harmonized as well in accordance with the CPR as with other legal provisions of the EU]:

- Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN xyz: date, title* or *ETA no. xyz, date, title* respectively.
- Performance data of the product, based on the harmonised standards, in accordance with the other provisions for harmonization.
- Voluntary data: *source, date, title* (not part of CE-marking)

[Alternative 3: Product for which no legal provisions for harmonisation of the EU exist]:

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

Base materials/Ancillary materials

The substrates can be made of different steel grades (DX51D to DX57D, S220GD to S550GD, HX260LAD to HX500LAD, /EN10346:2015/) with a pure Zinc metallic coating Z275 (275 g/m²)

total for both sides, equivalent to a coating thickness of 20µm /EN10346:2015/) and steel thicknesses ranging between 0.20 mm and 6.0 mm.

Detailed steel and coating properties and chemical compositions are available at:

<http://industry.arcelormittal.com/catalogue/E20/EN>

The base material of zinc coated steel is iron. Alloying elements are added on the form of ferroalloys or metals. The metallic coating includes only zinc.

Environment and health during use

Reference service life

Construction process (stages A4 & A5) and Use stage (B1-B7) are not declared in this EPD. A reference service life for zinc coated steel is not declared, since the lifetime will depend on specific application as well as environmental conditions.

LCA: Calculation rules

Declared Unit

The declaration refers to the functional unit of 1 metric ton of double-sided zinc coated steel as specified in Part B requirements on the EPD for Structural Steel /PCR Part B/ (1mm steel thickness with 275 g/m² pure Zinc metallic coating)

Declared unit

Name	Value	Unit
Declared unit	1	t
Thickness (of sheet)	1	mm
Density	7825	kg/m ³

For IBU core EPDs (where clause 3.6 is part of the EPD): for average EPDs, an estimate of the robustness of the LCA values must be made, e.g. concerning variability of the production process, geographical representativeness and the influence of background data and preliminary products compared to the environmental impacts caused by actual production.

System boundary

Type of the EPD: cradle to gate - with Options.

Module A1-A3, Module C3 and module D were considered.

Modules A1-A3 of the structural steel production, include:

- The provision of resources, additives and energy
- Transport of resources and additives to the production site
- Production processes on site including energy, production of additives, disposal of production residues, and consideration of related emissions
- Recycling of production/manufacturing scrap. Steel scrap is assumed to reach the end-of-waste status once is shredded and sorted, thus becomes input to the product system in the inventory.



Module C3

takes into account the sorting and shredding of after-use steel, as well as the non-recovered scrap due to sorting efficiency which is landfilled. A conservative value of 2% landfill is considered.

Module D refers to the End-of-Life of the structural steel, including reuse and recycling.

Data quality

All relevant background datasets are taken from the GaBi software database /GaBi ts Software/. Regarding foreground data, this study is based on high quality

of primary data, collected by ArcelorMittal.

The GaBi-database contains consistent and documented datasets which can viewed in the online GaBi-documentation /GaBi ts Documentation/.

Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product’s lifespan: Europe

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.

LCA: Scenarios and additional technical information

Current practice for the average hot dip galvanized steel consist of 98% recycling and 2% landfill according to the /European Commission Technical Steel Research/.

In case a **reference service life** according to applicable ISO standards is declared then the assumptions and in-use conditions underlying the determined RSL shall be declared. In addition, it shall be stated that the RSL applies for the reference conditions only.

The same holds for a service life declared by the manufacturer. Corresponding information related to in-use conditions needs

not be provided if a service life taken from the list on service life by BNB is declared.

End of life (C3)

Name	Value	Unit
Landfilling	2	%

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Recycling	98	%

LCA: Results

In Table 1 "Description of the system boundary", all declared modules shall be indicated with an "X"; all modules that are not declared shall be indicated with "MND" (As default the modules B3, B4, B5 are marked as MNR – module not relevant). In the following tables, columns can be deleted for modules that are not declared. Indicator values should be declared with three valid digits (eventually using exponential form (e.g. 1,23E-5 = 0,0000123). A uniform format should be used for all values of one indicator.

If several modules are not declared and therefore have been deleted from the table, the abbreviations for the indicators can be replaced by the complete names, while the readability and clear arrangement should be maintained; the legends can then be deleted. If due to relevant data gaps, an indicator cannot be declared in a robust way, then the abbreviation "IND" (indicator not declared) should be used for this indicator.

- 0 - calculated value is 0
- 0 - value falls under the cut-off
- 0 - assumption which exclude any flows (e.g. exported electricity A1-A3)
- IND – in cases where the inventory does not support the methodological approach or the calculation of the specific indicator IND shall be used.

If no reference service life is declared (see chapter 2.13 "Reference Service Life"), the LCA results of the modules B1-B2 and B6-B7 shall refer to a period of one year. This shall then be indicated as an explanatory text below the tables. In addition, the formula for the quantification of such B-modules over the total life cycle shall be provided.

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

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 metric ton of zinc coated steel

Parameter	Unit	A1-A3	C3	D
Global warming potential (GWP)	kg CO ₂ eq	2.56E+03	2E+00	-1.71E+03
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	5.19E-09	6.89E-12	3.36E-10
Acidification potential of land and water (AP)	kg SO ₂ eq	4.56E+00	6.78E-03	-4.13E+00
Eutrophication potential (EP)	kg PO ₄ ³ eq	4.72E-01	7.99E-04	-3.53E-01
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg Ethen eq	7.32E-01	4.75E-04	-5.3E-01
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	1.3E-01	9.53E-07	1.76E-04
Abiotic depletion potential for fossil resources (ADPF)	MJ	2.3E+04	2.25E+01	-1.36E+04

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 metric ton of zinc coated steel

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier (PERE)	MJ	1.4E+03	1.12E+01	1.24E+03
Renewable primary energy resources as material utilization (PERM)	MJ	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	1.4E+03	1.12E+01	1.24E+03
Non renewable primary energy as energy carrier (PENRE)	MJ	2.37E+04	3.43E+01	-1.28E+04
Non renewable primary energy as material utilization (PENRM)	MJ	0	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	2.37E+04	3.43E+01	-1.28E+04
Use of secondary material (SM)	kg	8.16E+01	0	8.98E+02
Use of renewable secondary fuels (RSF)	MJ	0	0	0
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0
Use of net fresh water (FW)	m ³	5.96E+00	1.53E-02	6E-01

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A1: 1 metric ton of zinc coated steel

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed (HWD)	kg	1.55E-05	2.18E-07	-8.98E-06
Non hazardous waste disposed (NHWD)	kg	1.15E+01	2.01E+01	-2.72E+01
Radioactive waste disposed (RWD)	kg	2.63E-01	4.7E-03	3.05E-01

Components for re-use (CRU)	kg	0	0	0
Materials for recycling (MFR)	kg	0	9.8E+02	0
Materials for energy recovery (MER)	kg	0	0	0
Exported electrical energy (EEE)	MJ	0	0	0
Exported thermal energy (EET)	MJ	0	0	0

Note: 81,6 kg scrap is used in the manufacturing of 1 ton of zinc coated steel. After use, 980 kg steel is recycled. The potential environmental benefit calculated for the end-of-life stage (module D) is based on the net amount of scrap in the system: 980 - 81,6 = 898,4 kg. The system has a net output of 898,4 kg scrap (which carries a potential credit), thus module D shows an environmental benefit.

References

/EN 10346:2015/ Continuously hot-dip coated steel flat products for cold forming. Technical delivery conditions

datasets for Life Cycle Engineering. LBP, University of Stuttgart and PE International, 2017.
<http://documentation.gabi-software.com>

/EN ISO 6892:2016/ Metallic materials — Tensile testing

/PCR Part A/, Product Category Rules for Building-Related Products and Services, Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. *Institut Bauen und Umwelt e.V.* (IBU) 2018 www.bau-umwelt.de

/EN ISO 9227:2017/ Corrosion tests in artificial atmospheres — Salt spray tests

/European Commission Technical Steel Research/ Sansom, M. and Meijer, J.: Life-cycle assessment (LCA) for steel construction, European Commission technical steel research, 2001-12

/PCR Part B/, Requirements on the EPD for Structural steels - *Institut Bauen und Umwelt e.V.*, Berlin (pub.): From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU), 2017

/GaBi ts Software/ GaBi ts. Software and Databasis for Life Cycle Engineering. LBP, University of Stuttgart und PE International, 2017.

The literature referred to in the Environmental Product Declaration must be listed in full. Standards already fully quoted in the EPD do not need to be listed here again. The current version of PCR Part A and PCR Part B of the PCR document on which they are based must be referenced.

/GaBi ts Documentation/ Documentation of the GaBi



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