ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	ArcelorMittal Europe – Flat Products
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Hot dip galvanized steel with pure Zinc coating
ArcelorMittal

Institut Bauen und Umwelt e.V.

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ECO PLATFORM EPD EN 15804 VERIFIED

General Information

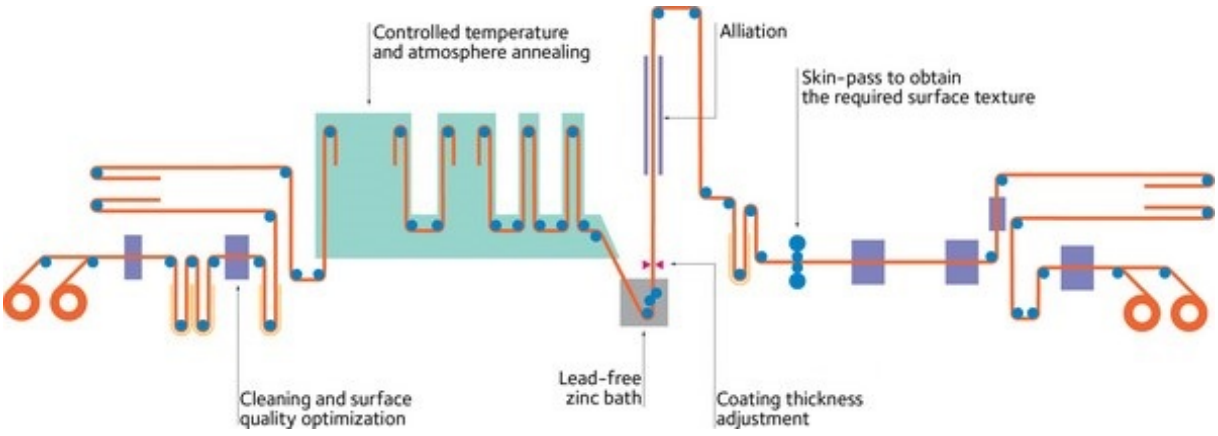
ArcelorMittal	Hot dip galvanized steel with pure Zinc coating
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** ArcelorMittal Europe – Flat Products 24-26 Boulevard d'Avranches L-1160 Luxembourg Luxembourg
Declaration number EPD-ARM-20170139-IBD1-EN	**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)
This declaration is based on the product category rules: Structural steels, 07.2014 (PCR checked and approved by the SVR)	**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.
Issue date 25/01/2019	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.
Valid to 24/01/2024	**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.)	
Dipl. Ing. Hans Peters (Head of Board IBU)	Mr Carl-Otto Neven (Independent verifier appointed by SVR)

Product

Product description / Product definition

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/.

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.

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/m³
Conversion factor to 1 kg	0.001	-
Conversion factor to 1 m²	0.00813	-

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/.

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.

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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/.

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

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

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: 1 metric ton of zinc coated steel

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO_2-Eq.]	2.56E+3	2.00E+0	-1.71E+3
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.19E-9	6.89E-12	3.36E-10
Acidification potential of land and water	[kg SO_2-Eq.]	4.56E+0	6.78E-3	-4.13E+0
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	4.72E-1	7.99E-4	-3.53E-1
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	7.32E-1	4.75E-4	-5.30E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.30E-1	9.53E-7	1.76E-4
Abiotic depletion potential for fossil resources	[MJ]	2.30E+4	2.25E+1	-1.36E+4

RESULTS OF THE LCA - RESOURCE USE: 1 metric ton of zinc coated steel

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	1.40E+3	1.12E+1	1.24E+3
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	1.40E+3	1.12E+1	1.24E+3
Non-renewable primary energy as energy carrier	[MJ]	2.37E+4	3.43E+1	-1.28E+4
Non-renewable primary energy as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	2.37E+4	3.43E+1	-1.28E+4
Use of secondary material	[kg]	8.16E+1	0.00E+0	8.98E+2
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m^3]	5.96E+0	1.53E-2	6.00E-1

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 metric ton of zinc coated steel

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	1.55E-5	2.18E-7	-8.98E-6
Non-hazardous waste disposed	[kg]	1.15E+1	2.01E+1	-2.72E+1
Radioactive waste disposed	[kg]	2.63E-1	4.70E-3	3.05E-1
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	9.80E+2	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+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.

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