

Environmental Product Declaration

In accordance with ISO 14025:2006 for:

Galvanized steel sheets(MACOSTA)



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General information

Product information

Programme:	The International EPD® System
Address:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden.
Website:	www.envirodec.com ; www.environdecindia.com
E-mail:	Info@envirodec.com

Product category rules (PCR): PCR 2015:03 Basic iron or steel products & Special steels, except construction steel products
PCR review was conducted by: The Technical Committee of the International EPD® System. Chair: Massimo Marino Contact via info@environdec.com
Independent third-party verification of the declaration and data, according to ISO 14044:2006: <input checked="" type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification
Third party verifier: <name, organisation and signature of the third party verifier> Ik Kim(Smart-Eco co,)
Procedure for follow-up of data during EPD validity involves third party verifier: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

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EPDs within the same product category but registered in different EPD programs, 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 characterization factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14044.

LCA Study & EPD Design Conducted by

Byungjik Lee,

LCA Consultant, bj.lee@ecoplus.kr; www.ecoplus.kr

Sungwon Hwang,

LCA Consultant, sw.hwang@ecoplus.kr; www.ecoplus.kr

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Company information

Owner of the EPD:

POSCOSTEELEON Company Limited

Head office Address :

173, Cheolgang-ro, Nam-gu, Pohang-si, Gyeongsangbuk-do

Factory Address :

173, Cheolgang-ro, Nam-gu, Pohang-si, Gyeongsangbuk-do

Contacts:

jklee3624@poscosteeleon.com

For more information on this environmental statement, please contact:

Tel : 054-280-6653

Fax : 054-280-6623

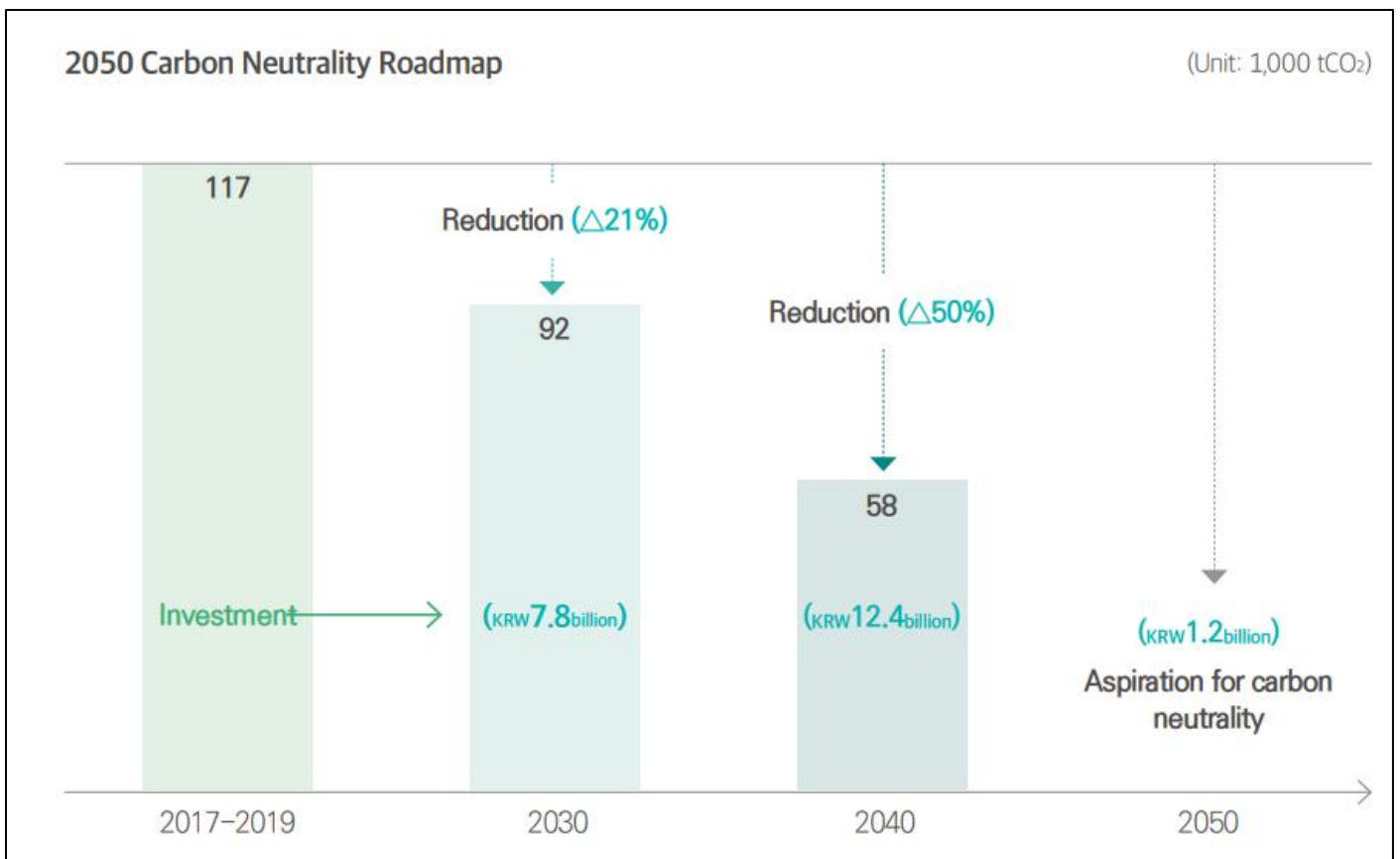
E-mail : jklee3624@poscosteeleon.com

Company Overview

Since its founding in 1988 as a specialist in steel surface treatment, POSCO STEELEON has led the plated/colored steel sheet market by pursuing continuous technological innovations and supplying products of the highest quality. Our main products are aluminum-, zinc-plated and color-coated steel sheets, which are supplied to various industrial sectors including the construction, home appliance, and automobile sectors in major global markets such as North America, China, and Europe. Based on our consolidated financial statements for 2023, our domestic sales amounted to KRW 668 billion (approximately 57.7%), while our overseas sales amounted to General Status KRW 491 billion (approximately 42.3%).

POSCOSTEELEON's Carbon Neutrality Action Plan

We are committed to implementing eco-friendly management to protect the global environment according to our previous declaration of "2050 Carbon Neutrality". To achieve this, POSCO STEELEON has set a stepby-step reduction target of 21% in 2030 and 50% in 2040, and has established a plan to gradually increase the related investment amount. The reduction target was determined based on the average emissions from 2017 to 2019. Some 54% of our GHGs are generated from direct emissions. In order to achieve the 21% reduction target by 2030, we will implement detailed plans in 10-year increments based on the reduction performance of direct and indirect emissions.






Products Information

The following Life Cycle Assessment study is about the production of three types of Galvanized steel sheet used for various purposes depending on the galvanized properties.

Product name : Galvanized steel sheet

The productive process includes :

POSCO STEELEON manufactures products recognized for the highest quality in the galvanized steel sheet industry thanks to its unrivaled technological prowess, and now aims to become a worldclass surface treatment steel sheet company by pursuing continuous technological innovation. POSCO STEELEON produces the highest quality products in the field of coated steel based on its unrivaled technological expertise and is concentrating all its efforts on becoming a world-class company specializing in surface-treated steel sheets based on continuous technological innovation.

ALCOSTA (Aluminized Steel)	MACOSTA (Zinc Magnesium Aluminum Alloy Coated Steel)	ALZASTA (Zinc Aluminized Steel)
<p>POSCO STEELEON's ALCOSTA is a high-corrosion resistant aluminized steel sheet with outstanding heat resistance compared to other galvanized and cold-rolled steel sheets. ALCOSTA has been selected as the world's top product offering the best quality by the Ministry of Trade, Industry and Energy.</p>	<p>MACOSTA is a ternary hot-dip Zn-Al-Mg alloy steel sheet with outstanding corrosion resistance. It is ten times more corrosion resistant than any other galvanized steel sheet, allowing it to be used in any environment.</p>	<p>A 55%Al-43%Zn-2%Si ternary alloy hot-dipped cold rolled steel sheet. It has the durability of 3-4 times as good as galvanized steel sheets and high corrosion resistance by the solid oxide coating of aluminum and sacrificed protection of zinc. The exterior is in light gray color with distinct fine spangles on the surface. It is applied to interior and exterior building materials with good painting adhesion.</p>
Main Uses		
<p>Automotive parts (mufflers, engine covers, etc.) /Home appliances (electric rice cookers, microwave ovens, etc.) / building materials, etc.</p> 	<p>Building materials (steel houses, safety scaffolding, solar power support, etc.) / Automotive parts (fuel filter housing, motor cases, etc.) / color disk, etc.</p> 	<p>Outdoor unit of air conditioner, interior/exterior panel, spiral duct, panel board, color roofing, etc.</p> 

UN CPC Code : 412

Geographical scope : Global

LCA information

Functional unit / Declared unit:

1000 kg of rolled stainless steel.

Description of system boundaries:

Cradle-to-gate for rolled stainless steel.

The life cycle of products is divided into 3 different life cycle stages:

- (1) Upstream processes (from cradle-to-gate)
- (2) Core processes (from gate-to-gate): This module represents the extraction and processing of raw materials, the transport to production sites and the manufacture and packaging.
- (3) Downstream processes (from gate-to-grave): These processes are excluded since the LCA study shall follow the "cradle-to-gate" principles.

Database(s) and LCA software used:

Ecoinvent v3.10 (allocation, cut-off by classification) database and SimaPro v9.6 software have been used for the LCA calculations. LCA methods used are EN 15804:2012+A2:2019 compliant.

EN 15804:2012+A2:2019/AC:2021 Method

The environmental impact calculation used to perform EN 15804:2012+A2:2019/AC:2021 was performed according to methodology EF 3.1

Data quality and data collection:

1. Data collection of the study

1.1. Introduction of data collection

As a result of the application of the cut-off rules, coils and ingots are included in the system as raw materials used in the core processes.

Below life cycle stages are followed the PCR 2015:03 Basic iron or steel products & special steels, except construction products (2.1.1). The detailed data collection per life cycle stages is as follows.

1.2. Upstream processes (from cradle-to-gate)

The upstream process is cradle-to-gate, so raw material input and transportation data are collected.

The detailed data is as follows

1.3. Raw material input

Coils and Ingots are subject to raw material input data collection due to the cutoff.

1.4. Transport

Coil, Ingot are targeted for data collection in the case of transport.

1.5. Core processes (from gate-to-gate)

Coil and ingot are targeted for data collection in the case of raw material input.

Electricity, LNG, Steam, Top water are targeted for data collection in the case of utility.

Wastewater sludge, synthetic resins, waste refractories, waste glass fiber, waste machine oil, waste insulating oil, other waste oil, scrap, waste water, vapor are targeted for data collection in the case of waste.

2. Data quality assessment

According to the requirements in PCR 2015:03, specific data was used for upstream processes (from cradle-to-gate). In the upstream processes, no specific data is used except for transportation. Data on the extraction and production of raw materials and the production of primary and secondary packaging are not collected because there are so many suppliers that individual data collection is not possible. Therefore, the most similar database is linked. Also, the specific data was used in core processes (from gate to gate) per PCR. Specific data includes actual manufacturing process for steel, waste generated during manufacturing and its treatment.

The data quality assessment is carried out on the specific data used according to EN 15804:2012+A2:2019. The data quality assessment shall cover the three areas, time-related coverage, geography coverage and technology coverage. The data quality assessment on these three areas is advanced on the basis of Annex E in the EN 15804:2012+A2:2019. In Annex E, the following schemes shall be applied for the data quality assessment of generic and specific data.

As a result, Geographical Representative, Technical Representative, Time Representative are as follows. First, the data quality of the geographical representative is "very good". This is because the specific data are used. Thus, the dataset is fully representative for the geography specified in the "location" specified in the metadata.

Second, the data quality of the technical representative is "very good". This is because there is only one plating plant. The technology used is therefore accurately described.

Finally, the data quality of the time representative is "very good". Because the range of specific data collected is "2023.01 ~ 2023.12"

and the used version of ecoinvent is 3.10, so the "data set valid until" and the difference between the "valid until" and the "reference year" is not higher than 8 years.

Data quality level and criteria from the Product Environmental Footprint Category Rules

Quality level	Geographical representative	Technical representative	Time representative
Very good	The processes included in the data set are fully representative for the geography stated in the "location" indicated in the metadata.	Technology aspects have been modelled exactly as described in the title and metadata, without any significant need for improvement	Data are not older than 0 years as expressed in the ILCD field("data set valid until" and the difference between the "valid until" and the "reference year" is not higher than 8 years)
Good	The processes included in the data set are well representative for the geography stated in the "location" indicated in the metadata.	Technology aspects are very similar to what described in the title and metadata, with need for limited improvements. For example: use of generic technologies' data instead of modelling all the single plants.	Data are not older than 3 years as expressed in the ILCD field("data set valid until" and the difference between the "valid until" and the "reference year" is not higher than 8 years)
Fair	The processes included in the data set are sufficiently representative for the geography stated in the "location" indicated in the metadata. E.g. the represented country differs but has a very similar electricity grid mix profile	Technology aspects are similar to what described in the title and metadata but merits improvements. Some of the relevant processes are not modelled with specific data but using proxies.	Data are not older than 6 years as expressed in the ILCD field("data set valid until" and the difference between the "valid until" and the "reference year" is not higher than 8 years)
Poor	The processes included in the data set are only partly representative for the geography stated in the "location" indicated in the metadata. E.g. the represented country differs and has a substantially different electricity grid mix profile	Technology aspects are different from what described in the title and metadata. Requires major improvements.	Data are not older than 10 years as expressed in the ILCD field("data set valid until" and the difference between the "valid until" and the "reference year" is not higher than 8 years, confirmed by the reviewer(s))
Very poor	The processes included in the data set are not representative for the geography stated in the "location" indicated in the metadata.	Technology aspects are completely different from what described in the title and metadata. Substantial improvement is necessary.	Data are older than 10 years as expressed in the ILCD field("data set valid until" and the difference between the "valid until" and the "reference year" is not higher than 8 years)

Allocation:

The products produced in the plating factory are ALZASTA, MACOSTA and ALCOSTA. There are 1,2 CGL lines in the plating factory. In 1 CGL line only ALZASTA and ALCOSTA products are produced. In 2 CGL line, only MACOSTA and ALCOSTA products are produced.

Utility consumption and waste generation are measured as follows. LNG, tap water, steam, wastewater sludge, synthetic resins, waste refractories, waste glass fiber, waste machine oil, waste insulating oil, other waste oil, and waste water data are measured based on the entire factory unit. Electricity and LNG consumption are also measured based on the 1, 2 CGL line.

[Raw material input]

No allocation is applied as the raw material input data is managed by product.

[Utility & Waste]

Electricity managed by line is allocated by calculating the monthly production ratio of ALZASTA and ALCOSTA products (sum of production ratio of both products is reported as 100%) for 1 CGL line. For 2 CGL lines, the calculation and allocation is based on the monthly production ratio of MACOSTA and ALCOSTA products (the sum of the production ratio of both products is reported as 100%). LNG consumption data is managed on a line-by-line and factory-wide basis. The allocation for 1 CGL line is calculated based on the monthly production ratio of ALZASTA and ALCOSTA products (the sum of the production ratio of both products is reported as 100%). The allocation for 2 CGL line is calculated based on the monthly production ratio of MACOSTA and ALCOSTA products (the sum of the production ratios of both products is reported as 100%).

In the case of LNG, the consumption data is managed by the unit of the whole of the factory. The allocation of the LNG is calculated based on the monthly production ratio of three products (the total sum of production ratio is 100%).

Steam, water(tap water), waste(wastewater sludge, synthetic resins, waste refractories, lung support, other waste wood, waste glass fiber, waste machine oil, waste insulating oil, other waste oil) and wastewater(wastewater), which are managed throughout the factory, are allocated by calculating the monthly production rate of the three products (the sum of the production rate of the three products is reported as 100%) since there are only three products produced in the plating factory: ALZASTA, ALCOSTA, and MACOSTA.

Cut-off rules:

According to PCR, the environmental impact criteria are calculated up to 99% and the remainder is cut-off. 99% of the environmental impact is from coils and ingots of raw materials. For this product, the coil accounts for more than 97% of the weight and the ingot accounts for more than 2%, so even if the other raw materials are connected to the most influential substance at 0.3%, it cannot satisfy 1%.

Input and output flows of mass and energy greater than 1% (based on the total mass final product and total energy usage of the product system) or greater than 1% of environmental impacts were included within the scope of analysis. Flows less than 1% are included with sufficient data available to warrant inclusion and/or the flow was thought to have a significant environmental impact. Where data gaps were identified, they are filled by conservative assumptions with average, generic, or proxy data, and assumptions are documented. No known flows relevant to the product system are deliberately excluded from this LCA and EPD

Content information

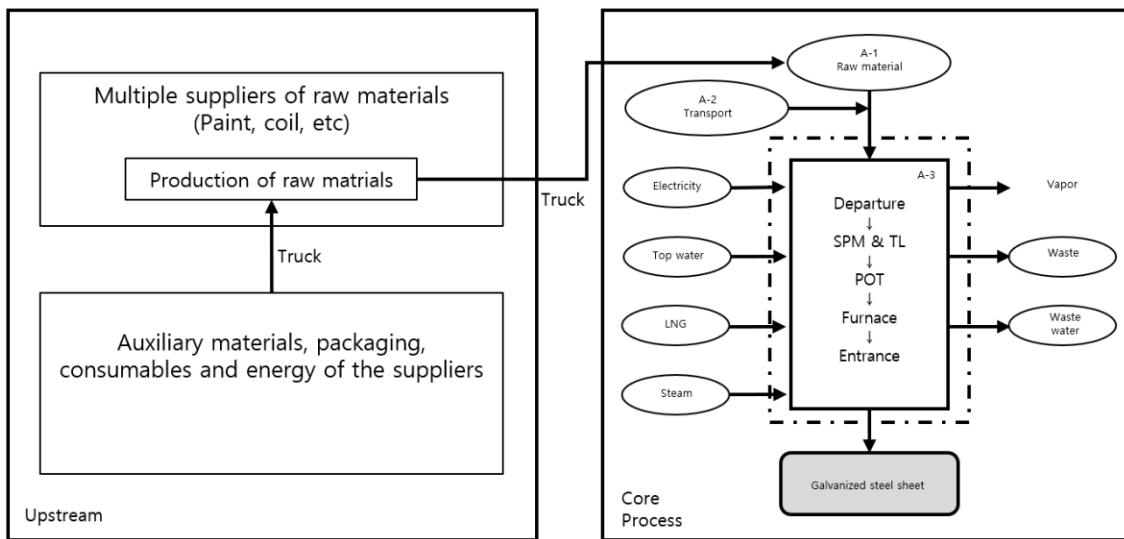
Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Coil / steel cold Rolled coil	9.94E+02	97.41%	0.00E+00
Ingot / Al, Zn	2.28E+01	2.23%	0.00E+00
ETC	3.71E+00	0.36%	0.00E+00
TOTAL	1.02E+03	100%	0.00E+00

System diagram

The diagram below shows two life cycle stages. A description of the life cycle stages is described in the system boundary section at the right upper side.

In the upstream stage, auxiliary materials, packaging, consumables and energy from suppliers are transported by truck to the raw material production sites.

In the core process, the produced raw materials are transported by truck to the plating factory and used in the production process of galvanized steel sheet.



Environmental Performance

The tables below show the results of the overall calculation for 1,000 kg of MACOSTA galvanized steel sheet. The environmental impact is calculated over the parameters of the categories in the above tables, according to EN 15804:2012+A2:2019/AC:2021.

Potential environmental impact – mandatory indicators

Results for 1,000kg of Galvanized steel sheet				
Indicator	Unit	Total	Upstream	Core
GWP-fossil	kg CO ₂ eq	2.15E+03	2.08E+03	6.96E+01
GWP-biogenic	kg CO ₂ eq	2.74E+00	2.01E+00	7.34E-01
GWP-luluc	kg CO ₂ eq	9.86E-01	9.47E-01	3.91E-02
GWP-total	kg CO ₂ eq	2.15E+03	2.08E+03	7.03E+01
ODP	kg CFC11 eq	1.61E-05	1.07E-05	5.36E-06
AP	mol H+ eq	1.27E+01	1.25E+01	2.78E-01
EP-freshwater	kg P eq	9.56E-01	9.10E-01	4.63E-02
EP- marine	kg N eq	2.49E+00	2.38E+00	1.15E-01
EP-terrestrial	mol N eq	2.27E+01	2.18E+01	8.88E-01
POCP	kg NMVOC eq	7.56E+00	7.27E+00	2.90E-01
ADP-minerals&metals*	kg Sb eq	9.35E-03	5.10E-03	4.25E-03
ADP-fossil*	MJ	2.43E+04	2.18E+04	2.42E+03
WDP	m ³	6.22E+02	5.96E+02	2.59E+01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWPluluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for nonfossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption			

(* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator)

Potential Environmental Impact Additional Mandatory and Voluntary Indicators

Results for 1,000kg of Galvanized steel sheet				
Indicator	Unit	Total	Upstream	Core
GWP - GHG*	kg CO ₂ eq	2.15E+03	2.08E+03	6.96E+01

(* Disclaimer: The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.)

Use of Resources

Results for 1,000kg of Galvanized steel sheet				
Indicator	Unit	Total	Upstream	Core
PERE	MJ	0.00E+00	0.00E+00	0.00E+00
PERM	MJ	1.20E+03	1.17E+03	2.77E+01
PERT	MJ	1.20E+03	1.17E+03	2.77E+01
PENRE	MJ	1.56E+04	1.47E+04	8.50E+02
PENRM	MJ	2.09E+01	2.08E+01	5.35E-02
PENRT	MJ	1.56E+04	1.47E+04	8.50E+02
SM	Kg	2.83E+01	0.00E+00	2.83E+01
RSF	MJ	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00
FW	m ³	6.22E+02	5.96E+02	2.59E+01
Acronyms		PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water		

Waste production

Results for 1,000kg of Galvanized steel sheet				
Indicator	Unit	Total	Upstream	Core
Hazardous waste disposed	kg	8.15E-02	7.61E-02	5.48E-03
Non-hazardous waste disposed	kg	7.78E-01	7.37E-01	4.15E-02
Radioactive waste disposed	kg	2.43E+02	2.45E+02	-1.79E+00

Output flows

Results for 1,000kg of Galvanized steel sheet				
Indicator	Unit	Total	Upstream	Core
Component for re-use	kg	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	2.04E+01	0.00E+00	2.04E+01
Materials for energy recycling	kg	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00
Radioactive waste disposed	MJ	0.00E+00	0.00E+00	0.00E+00

Additional environmental information

The base material of the Galvanized steel sheet is iron. No substances required to be reported as hazardous are associated with the production of this product.

Dangerous Substance

All chemicals used in the POSCOSTEELEON factory are managed in accordance with the Korean Toxic Chemicals Control Act. Substances listed on the Candidate List of Substances of Very High Concern (SVHC) for authorization published by European Chemicals Agency (ECHA) are not contained in the steel in declarable quantities.

References

General Programme Instructions of the International EPD[®] System. Version 4.0.

International EPD PCR 2015:03

Basic iron or steel products & special steels, except construction products (2.1.1)

EN 15804:2012+A2:2019

Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction product

ISO 14044:2006

Environmental management — Life cycle assessment — Requirements and guidelines

POSCO STEELEON sustainability report 2023