

Environmental Product Declaration



In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019 for:

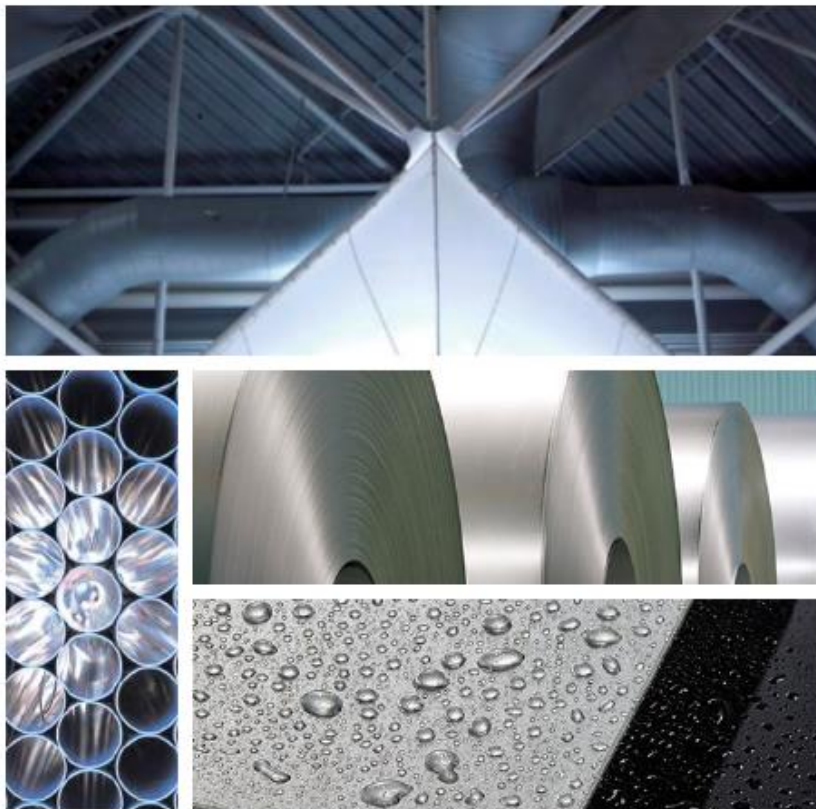
Hot-Dipped Galvanized Steel Sheets

from

DONGKUK CM



Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-07699
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Revision date: 2024-04-09 (Version 1.1)	<i>An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com</i>



General information

Programme information

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

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): Product Category Rules for Construction Products (PCR 2019:14) version 1.3.3 and UN CPC code: 41231(flat-rolled products of non-alloy steel, clad, plated, coated or otherwise further worked)
PCR review was conducted by: The International EPD® System Technical Committee Visit www.environdec.com for full list of members. Chair of the PCR review: <i>Claudia A. Peña, University of Concepción, Chile.</i> The review panel may be contacted via info@environdec.com
Life Cycle Assessment (LCA)
LCA accountability: <i>Yoosung Park, H.I.Pathway Co.,Ltd.</i>
EPD verification by individual
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: <input checked="" type="checkbox"/> EPD verification by individual verifier Third-party verifier: Noh-hyun Lim, IGSC Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

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

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Dongkuk CM

Contact: Myungsuk Ryu, e-mail: myungsuk.ryu@dongkuk.com, tel: +82 2 2222 0049

Description of the organisation:

Dongkuk Steel, the parent company of Dongkuk CM, is the first private steel company established in July 1954. It has contributed to the development of the Korean steel industry for over half a century. The company pursues improvement and innovation under the management philosophy of providing products and services necessary for the improvement and advancement of human life, and further contributing to cultural development and endeavors to achieve the vision of becoming a Global Steel Company with the best competitiveness.

Dongkuk Steel will continue to grow by internalizing core values and faithfully implementing business policy.

Dongkuk Steel's business structure has been upgraded through the operation of a 50-ton class arc furnace for the first time in the domestic private sector, the first 15-ton class AC electric arc furnace in Korea, the introduction of a DC electric arc furnace in the early 1990s, the first entry into steel plate business in Korea, and the merger of cold-rolled steel plate business. We have also introduced an Eco-arc electric furnace in 2010, built wastewater-free discharge facilities at Incheon and Pohang Works, obtained the Good Recycled Product certification, and developed biomass using bio-paints, contributing to the realization of a low-carbon and circular society.

Dongkuk CM was established by dividing the hot-rolled steel business division and the cold-rolled steel business division for a better leap forward.

In 2022, we publish the first sustainability report that contains our commitment to change and innovation based on the sustainability value "Steel for Green". The "Steel for Green" aims to enable Dongkuk Steel Group's products and services to help people achieve sustainable life and growth. Dongkuk Steel Group has been focusing on building high-efficiency production infrastructure through smart factories, branding products such as Luxteel and DKOIL, strengthening competitiveness, and changing sales methods in order to deliver the best services and value to customers. In 2021, we became the world's first company to develop and commercialize large-scale sections through Tandem Mill using existing facilities, declared Color Vision 2030, and launched an e-commerce platform "steelshop." We will continue to take the lead in creating sustainable value by supplying products and services tailored to market needs.

[Overview]

Name : DONGKUK COATED METAL CO.,LTD. Establishment June 1, 2023

CEO : Vice President Sanghoon Park

Website : www.dongkukcm.com Category Small and midium-sized and listed enterprise (KOSPI 460850)

Head office : 19, Euljiro 5-gil (Ferrum Tower, Suha-dong), Jung-gu, Seoul

Business : Manufacturing and sale of cold-rolled steel plates

Products : Cold-rolled steel plates, pre-coated metal etc.

Product-related or management system-related certifications: ISO 9001, 14001 and 50001-certificates

Name and location of production site(s): Busan factory of DONGKUK CM, 102, Sinseon-ro, Nam-gu, Busan

Product information

Product name: Hot-Dipped Galvanized Steel Sheets

Product description:

Hot-Dipped Galvanized Steel Sheets are created with Dongkuk CM's top-tier coating technology. With a neatly finished surface and excellent corrosion resistance, galvanized steel is used in the production of interior and exterior materials for structures, automobiles products, and as a pre-coated metal.

GI (Galvanized Steel)

Created using the characteristics of zinc, this product provides excellent corrosion resistance, coatability, and workability. The amount of coating can be modified as necessary. The amount of coating can be modified accordingly. This product is used in internal or external plates for building materials, office equipment, fire doors, and home appliances.

GL (Galvalume Steel)

Al-Zn alloy galvanized steel product is made through the optimal synergy between the strengths of zinc and aluminum. These strengths are durability, heat resistance, and alkali/acidity resistance. Galvalume steel is used in materials for roofs, walls, and pipes.

UN CPC code: 41231

Geographical scope: Global

Product identification:

Designation			Chemical composition % by mass max.					Mechanical properties		
Steel grade		Symbols for the types of available coatings	C	Si	Mn	P	S	Yield strength (Mpa)	Tensile strength (Mpa)	Elongation %(Min)
Steel name	Steel number									
S220GD	1.0241	+Z, +ZM, +AZ	0.2	0.6	1.7	0.1	0.045	220	300	20
S250GD	1.0242	+Z, +ZM, +AZ						250	330	19
S280GD	1.0244	+Z, +ZM, +AZ						280	360	18
S320GD	1.025	+Z, +ZM, +AZ						320	390	17
S350GD	1.0529	+Z, +ZM, +AZ						350	420	16
S390GD	1.0238	+Z, +ZM, +AZ						390	460	16
S420GD	1.0239	+Z, +ZM, +AZ						420	480	15
S450GD	1.0233	+Z, +ZM, +AZ						450	510	14
S550GD	1.0531	+Z, +ZM, +AZ						550	560	-

Regulated Hazardous Substance

- The base material of the hot-dipped galvanized steel sheets is iron. The most common element for coating is zinc and aluminum. No substances required to be reported as hazardous are associated with the production of this product.

Dangerous Substance

- All chemicals used in the Busan 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.

LCA information

Functional unit / declared unit: 1 metric ton

Reference service life: Not applicable

Time representativeness: The production data are from 2021, and the database data are from 2013 – 2021 i.e., no data is older than 10 years.

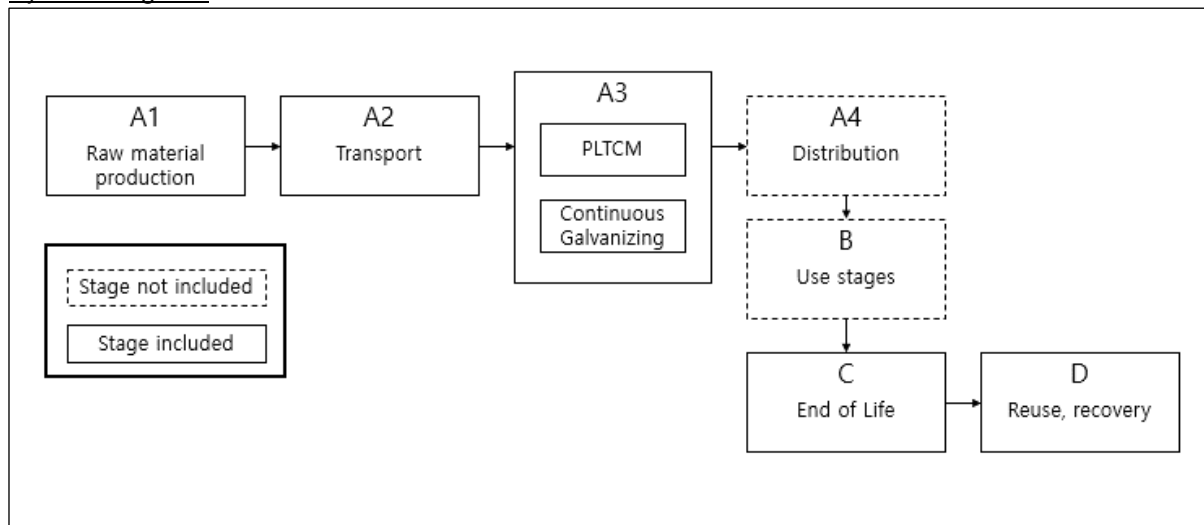
Database(s) and LCA software used: Database used is mainly Ecoinvent 3.8. The LCA software used is SimaPro 9.3.

Description of system boundaries:

LCA is made in “Cradle to gate with module C1-C4 and module D” form. All major materials, production energy use and waste are included for product stages A1, A2 and A3. The product is a steel plate. After the customer purchases the product, it is manufactured as a construction product and then applied to the construction site, so, Dongkuk CM does not have control over subsequent processes, and the usage data for each sector to which certified products are applied is not managed. Therefore, the installation (A4-A5) and use(B1-B7) are not the responsibility of Dongkuk CM. Demolition(C1), Transportation(C2), waste processing (C3), disposal(C4) and benefits and loads beyond the system boundary(D) are included in the life cycle.

All life cycle impacts are included, see flowchart below. The following information describes the scenarios in the different modules of the EPD. All major raw materials and all the essential energy are included. Marginal production process for raw materials and energy flows with a cut-off of 5% are not included. This cut-off rule does not apply to hazardous materials and substances.

System diagram:



More information: Electricity, waste and ancillary materials in production are calculated as an average weight per produced tonne of all products using yearly production data and the rate for 2021. For manufacturing processes, the specific country mix of electricity is considered. For secondary data on materials’ flow information has been gathered from the Ecoinvent 3.8. database. In addition, the allocation is made following the provisions of PCR 2019:14 Construction products (EN 15804:A2) (1.3.3). The transportation of the material is considered in this analysis. The polluter pays and modularity principles are followed. The processes excluded from analysis are environmental impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process and personnel-related impacts.

	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	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	RoW	RoW	KR	ND	ND	ND	ND	ND	ND	ND	ND	ND	GLO	RER	RoW	RoW	RoW
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = declared stage, ND = Not Declared

- Raw material supply (A1) : The material that is needed to produce ' Hot-Dipped Galvanized Steel Sheets' products is mostly hot-coil and zinc. Other materials that are used in the process have not been considered because of a quantity less than 1% in mass. However, according to the cut-off rule set out above, the environmental impact from the chromic acid which has significant environmental impact is reported in the EPD report.

- Transport (A2) : Steel materials are transported from Korea, Japan and China – 61,3 % from Korea for a distance of 300.4 km; 23.1 % from Japan for a distance of 837.4 km; 15.5 % from China for a distance of 1283.7 km.

Zinc and chromic acid materials are transported from Korea – 100% of zinc from Korea for a distance of 50.8 km; 100% of chromic acid from Korea for a distance of 34.5 km.

- Manufacturing (A3) : The processes that are included in the manufacturing phase are the rolling and coating of steel plate, of which energy consumption, auxiliary material consumption, waste and gaseous emissions have been modeled.

During the manufacturing process, there is created metal waste - 100% of metal wastes are recycled.

- De-construction demolition (C1) : Energy consumption of a demolition process is on average 10kWh/m² (Bozdog, Ö & Seçer, M. 2007). The average mass of a reinforced concrete building is about 1000 kg/m². Therefore, energy consumption during demolition is 0,01 kWh/kg. A conservative

assumption has been made that the energy consumed during demolition of a steel building is the same as that of a concrete building. The source of energy is diesel fuel used by work machines. It is assumed that 100% of the waste is collected and transported to the waste treatment centre.

- Transport (C2) : Transportation distance to treatment is assumed as 300 km and the transportation method is assumed to be lorry.

- Waste processing (C3) : Approximately 95% of steel is assumed to be recycled based on World Steel Association, 2020.

- Disposal (C4) : It is assumed that the remaining 5 % of steel is taken to landfill for final disposal.

- Reuse-Recovery-Recycling-potential (D) : Due to the recycling process, the end-of-life product is converted into recycled steel. In module C, it is assumed that 95% of the product is recycled, so 0.950 tons per declared unit is recycled. The target product of this report has a secondary material input of 0 tons at module A. Therefore, the net recycling amount of 0.95 tons.

Content information

Product components	Weight, %	Post-consumer material, weight-%	Renewable material, weight-%
Hot coil	98.8%	0%	0%
Zinc	2.2%	0%	0%
Others	2.1%	0%	0%
TOTAL	100.0%	0%	0%

Packaging materials	Weight, ton	Weight-% (versus the product)
Protection plate(inner)	2.17E-03	0.21%
Protective steel outer ring	1.05E-03	0.10%
HOOP	1.05E-03	0.10%
Metal protector	8.59E-04	0.09%
Protective steel inner ring	7.12E-04	0.07%
V.SKID	4.17E-04	0.04%
Protection plate(outer)	2.64E-04	0.03%
Others	1.18E-04	0.01%
TOTAL	6.64E-03	0.66%

Dangerous substances from the candidate list of SVHC for Authorisation	EC No.	CAS No.	Weight-% per functional or declared unit
Chromic acid	215-607-8	1333-82-0	0.0045%

Environmental Information

For construction services, the total value of A1-A3 shall be replaced with the total value of A1-A5.

Potential environmental impact – mandatory indicators according to EN 15804

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	2.94E+03	3.31E+00	2.61E+01	5.47E+01	3.30E+00	-1.59E+03
GWP-biogenic	kg CO ₂ eq.	2.78E+00	1.24E-03	2.77E-02	2.05E-02	4.85E-03	6.90E-01
GWP-luluc	kg CO ₂ eq.	8.08E-01	3.30E-04	9.79E-03	5.46E-03	1.35E-03	-3.40E-02
GWP-total	kg CO ₂ eq.	2.94E+03	3.31E+00	2.61E+01	5.47E+01	3.31E+00	-1.58E+03
ODP	kg CFC 11 eq.	1.44E-05	7.07E-07	6.51E-06	1.17E-05	7.53E-07	-3.60E-12
AP	mol H ⁺ eq.	8.31E+00	3.44E-02	8.32E-02	5.68E-01	3.34E-02	-3.53E+00
EP-freshwater	kg PO ₄ ³⁻ eq.	1.64E-01	1.03E-04	1.70E-03	1.69E-03	1.34E-04	-2.99E-04
EP-marine	kg N eq.	1.69E+00	1.52E-02	1.86E-02	2.52E-01	1.45E-02	-6.22E-01
EP-terrestrial	mol N eq.	1.74E+01	1.67E-01	2.03E-01	2.76E+00	1.58E-01	-5.46E+00
POCP	kg NMVOC eq.	6.01E+00	4.59E-02	8.01E-02	7.58E-01	4.37E-02	-2.52E+00
ADP-minerals&metals*	kg Sb eq.	2.14E-03	1.70E-06	6.24E-05	2.81E-05	2.65E-06	-4.10E-03
ADP-fossil*	MJ	2.94E+04	4.54E+01	4.25E+02	7.50E+02	4.91E+01	-1.51E+04
WDP	m ³	3.94E+02	7.11E-02	1.46E+00	1.17E+00	3.97E-01	-1.97E+04
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = 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 non-fossil 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.

※ In this report, the EF 3.1 package was used to calculate CF.

Additional mandatory and voluntary impact category indicators

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG ¹	kg CO ₂ eq.	2.94E+03	3.31E+00	2.61E+01	5.47E+01	3.30E+00	-1.59E+03

¹ This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO₂ is set to zero.

Use of resources

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	3.16E+02	1.97E-01	4.19E+00	3.25E+00	2.47E-01	4.86E+01
PERM	MJ	5.72E+01	5.83E-02	1.21E+00	9.62E-01	9.04E-02	-5.08E-01
PERT	MJ	3.73E+02	2.55E-01	5.40E+00	4.22E+00	3.38E-01	4.80E+01
PENRE	MJ	3.11E+04	4.82E+01	4.51E+02	7.97E+02	5.22E+01	-1.58E+04
PENRM	MJ.	6.65E-02	6.46E-04	2.01E-02	1.07E-02	7.07E-03	0.00E+00
PENRT	MJ	3.11E+04	4.82E+01	4.51E+02	7.97E+02	5.22E+01	-1.58E+04
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	1.02E+01	2.59E-03	5.05E-02	4.28E-02	1.04E-02	-6.90E+00
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 re-sources; 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 and output flows

Waste production

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2.88E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	6.48E+01	0.00E+00	0.00E+00	0.00E+00	5.00E+01	0.00E+00
Radioactive waste disposed	kg	1.37E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Output flows

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	4.03E-01	0.00E+00	0.00E+00	9.50E+02	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Differences Versus Previous Versions

2023-07-01 Version 1

2024-04-08 Version 1.1

Editorial change: The values of modules A1-A3 are consolidated and reported according to the new reporting format.

Technical change: Updated result of the Module D and cut-off criteria according to revised PCR

References

- EN 15804:2012+A2:2019. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- General Programme Instructions of the International EPD® System. Version 4.0
- ISO 14025:2006. Environmental labels and declarations — Type III environmental declarations — Principles and procedures
- ISO 14040:2006. Environmental management – Life cycle assessment – Principles and framework
- ISO 14044:2006. Environmental management – Life cycle assessment – Requirements and guidelines
- LCA software SimaPro 9.3
- PCR 2019:14 Construction products (EN 15804:A2) (1.3.3)
- AS 1397:2011 - Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium



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