

# Environmental Product Declaration



SOUTH KOREA

THE INTERNATIONAL EPD SYSTEM



In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

## ***Pre-Coated Metal (PCM)***

from

***DK DONGSHIN***



Programme:

The International EPD® System, [www.environdec.com](http://www.environdec.com)

Programme operator:

EPD International AB

EPD registration number:

S-P-03314

Publication date:

2024-04-25

Valid until:

2029-04-25

*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](http://www.environdec.com)*



## General information

### Programme information

<b>Programme:</b>	The International EPD® System
<b>Address:</b>	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
<b>Website:</b>	<a href="http://www.environdec.com">www.environdec.com</a>
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### 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): *PCR 2019:14 Construction products (version 1.3.3) and 412*

PCR review was conducted by: *<name and organisation of the review chair, and information on how to contact the chair through the programme operator>*

#### Life Cycle Assessment (LCA)

LCA accountability: *Sungmo Yeon, H.I.Pathway Co., Ltd.*

#### Third-party verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

EPD verification by individual verifier

Third-party verifier: *< Noh-hyun Lim(IGSC), Certiquality Srl >*

The certification body is accredited by: Accredia

OR

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes  No

[Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period. The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update is identified, the EPD shall be re-verified by a verifier]

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

EPDs within the same product category but registered in different EPD programmes, 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 characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

**Company information**

Owner of the EPD: DK Dongshin Co., Ltd  
Contact: LEE Su-Won / lsw955@dkdongshin.co.kr / 010-4265-7225  
Description of the organisation: DK Dongshin produced and commercialized Pre-Coated Metal (PCM) for the first time in Korea since the foundation in 1976. we are producing the material for home appliances and construction which are very close to our life. DK Dongshin always reflects the customer's needs and jumps up the global leader of Pre-Coated Metal (PCM) with endless innovation.  
Product-related or management system-related certifications: An Environmental Management System compliant with the international standard ISO 14001 has formalized its commitment, awareness of environmental issues and maintained its environmental performance over time.



Name and location of production site(s): Headquarter and Pohang factory/ 154, Daesong-ro, Nam-gu, Pohang-si, Gyeongsangbuk-do, South Korea

## Product information

**Product name:** PCM (Pre-Coated Metal (PCM))

**Product identification** The CEN standard EN 15804:2012+A2:2019 serves as the core PCR. In addition, PCR 2019:14 Construction products (version 1.3.3) and the EN 10204

**Product description:** Pre-Coated Metal (PCM) sheets are processed by after painting the base color on the cold-rolled steel sheet, various patterns were assigned with a special printing method (GRAVURE-OFF SET), finished with transparent CLEAR, and at the same time secured the necessary physical properties (weather resistance and corrosion resistance) for building materials. Furthermore, CLEAR can create a three-dimensional effect through additional pattern printing. As raw materials, cold rolled steel sheets (CR), electro-galvanized steel sheets (EGI), hot-dip galvanized steel sheets (GI), and aluminiums (AL) are applied.

The specification of the PCM (Pre-Coated Metal (PCM)) has various patterns and surface texture and sophisticated appearance. And also give various patterns and colors through 3 coating, 3 baking method of GRAVURE-OFF SET prints after base coating. So, these can offer many options for customers.

The Pre-Coated Metal (PCM) grants not only have high durability on weather and corrosion resistance but also have a great resistance of scratch resistance and safety workability through surface texture.

Layer	Thickness	Functions
Protective film	50~60 $\mu\text{m}$	Protecting products surface (Option)
Clear	10 $\pm$ 2 $\mu\text{m}$	Glossy, half-glossy, matt, TEXTURE, Wrinkle (Option)
Print	1 $\mu\text{m}$	Various patterns as continuous or One-point with having 1 <sup>st</sup> to 4 <sup>th</sup> layer
Base	20 $\pm$ 2 $\mu\text{m}$	Base color
Primer	5 $\pm$ 2 $\mu\text{m}$	Grants cohesion, corrosion resistance
Chemical treatment	$\pm$ 200/ $\text{m}^2$	Grants cohesion, corrosion resistance
Raw material	0.3~1.2 mm	CR, EGI, GI, AL (But AL:MAX 1.5mm) option

In addition to products with the above specifications, reinforcing bar products produced at the Pohang Plant and Incheon Plant are included.

**UN CPC code:** 41231

**Geographical scope:** The production site of DK Dongshin is located at Pohang city (154, Daesong-ro, Nam-gu, Pohang-si, Gyeongsangbuk-do, South Korea). Product use was excluded from the scope of environmental impact calculations in this study. For the end of life stage, the environmental impact was calculated based on product disposal statistics from the World Steel Association, 2020.

**LCA information**

Functional unit / declared unit: 1 metric ton (1,000 kg)

Reference service life: Not applicable

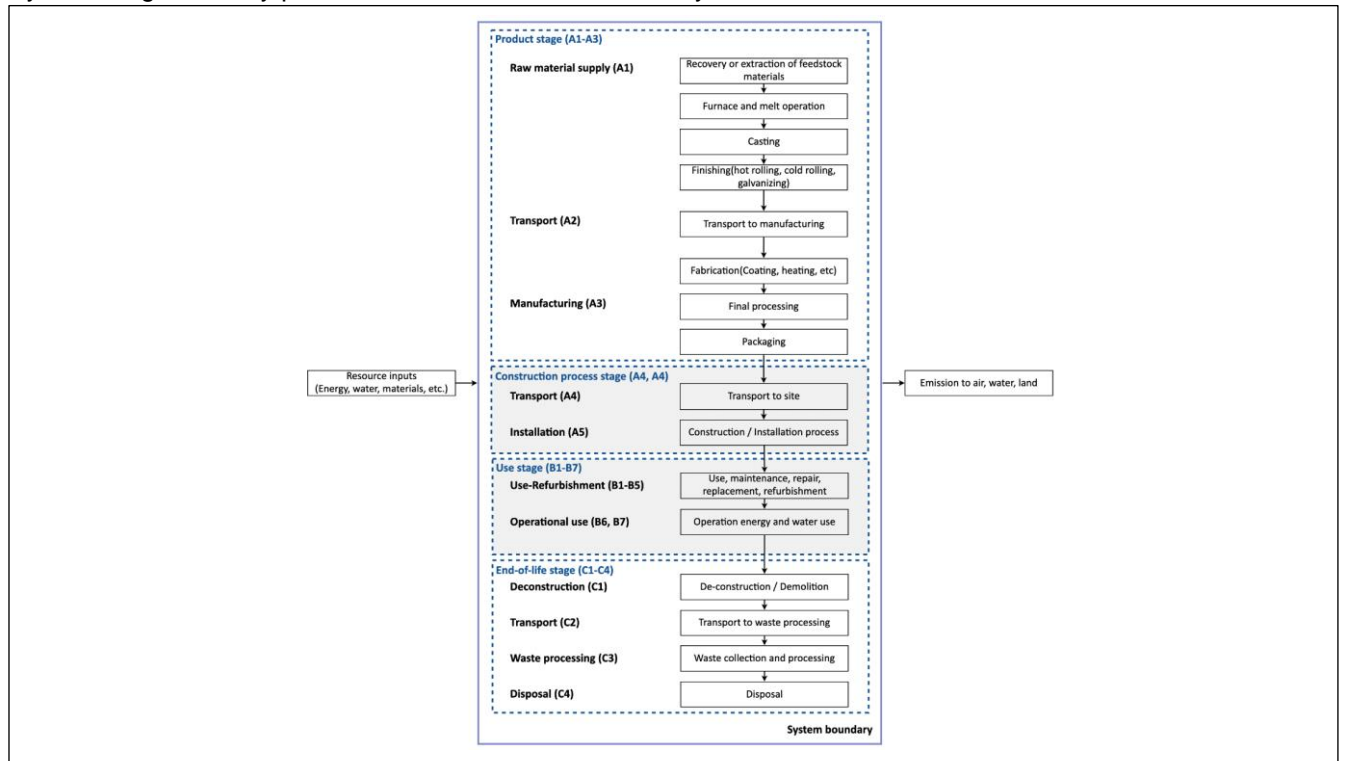
Time representativeness: The production data are from 2023, and the database data are from 2022 i.e., no data is older than 10 years.

Database(s) and LCA software used: Database used is mainly Ecoinvent 3.9.1. The LCA software used is SimaPro 9.5.0.1

Description of system boundaries:

According to the PCR, the included life cycle stages are product stage (modules A1-A3), construction stage (modules A4-A5), use stage (B1-B7), end of life stage (modules C1-C4) and benefits and loads beyond the system boundary (D). All major materials, production energy use and waste are included for product stages A1, A2 and A3. The product is a Pre-Coated Metal (PCM). After the customer purchases the product, it is manufactured as a construction product and then applied to the construction site, so, DK Dongshin 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 DK Dongshin. 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. All raw material and energy flows were included in the environmental impact assessment.

System diagram: Gray phases are excluded from this study.



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 2022. For manufacturing processes, the specific country mix of electricity is considered. For secondary data on materials' flow information has been gathered from the Ecoinvent 3.9.1. database. In addition, the allocation is made following the provisions of PCR 2019:14 Construction products (EN 15804:A2) (1.11). According to PCR, a minimum of 95% of total inputs(mass) per module has been in the life cycle modelling. The transportation of the material is considered in this analysis. The polluter pays and

modularity principles are followed. The processes excluded from analysis are infrastructure, maintenance efforts for infrastructure, personnel lodging and transport, employee commute, administration.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	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	EU	EU	EU	EU	RoW
Specific data used	> 95%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = declared stage, ND = Not Declared

- Raw material supply (A1)

The main raw materials used to produce the PCM are as follows.

A. Galvanized iron

B. Paint

- Transport (A2)

The transport of raw materials and packaging is carried out by suppliers to the Pre-Coated Metal (PCM) production site by various transport modes. Transportation distance information is listed in below table.

Inputs	Amount per functional unit		
	Transport mode	Distance (km)	Load (ton-km)
Galvanized iron	International supply chain	Truck	100.59
	International supply chain	Ocean shipping	376.62
	National supply chain	Truck	207.81
			105.262
			394.119
			217.468

#### - Manufacturing (A3)

All energy, industrial water, gas and environmental emission data are collected and calculated based on 2023 production year.

The manufacturing process of module A3 is Rep of Korea, and the environmental impact was calculated using the "Electricity, medium voltage {KR} | electricity voltage transformation from high to medium voltage | Cut-off" ( $GWP_{fossil} = 6.94E-01$  kgCO<sub>2</sub>-eq./kWh,  $GWP_{biogenic} = 6.77E-04$  kgCO<sub>2</sub>-eq./kWh,  $GWP_{luluc} = 3.67E-04$  kgCO<sub>2</sub>-eq./kWh), "natural gas, liquefied {RoW} | natural gas, liquefied, import from QA | Cut-off" ( $GWP_{fossil} = 5.50E-01$  kgCO<sub>2</sub>-eq./m<sup>3</sup>,  $GWP_{biogenic} = 2.08E-04$  kgCO<sub>2</sub>-eq./m<sup>3</sup>,  $GWP_{luluc} = 2.26E-04$  kgCO<sub>2</sub>-eq./m<sup>3</sup>), the "diesel {RoW} | diesel production, petroleum refinery operation | Cut-off" ( $GWP_{fossil} = 7.82E-01$  kgCO<sub>2</sub>-eq./kg,  $GWP_{biogenic} = 2.47E-04$  kgCO<sub>2</sub>-eq./kg,  $GWP_{luluc} = 2.28E-04$  kgCO<sub>2</sub>-eq./kg).

In this study, wastes sent to landfill and incineration were modeled. For wastes sent to recycling facility, only transport from Pre-Coated Metal (PCM) site to treatment facility was considered.

#### - De-construction demolition (C1)

Energy consumption of a demolition process is on average 10kWh/m<sup>2</sup> (Bozdog, Ö & Seçer, M. 2007). The average mass of a reinforced concrete building is about 1000 kg/m<sup>2</sup>. 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.

#### - Transport (C2)

Transportation distance and truck type from the construction site to the recycling site / final disposal(landfill) is assumed as 300 km and the Lorry, >32 metric tons, Euro V.

#### - Waste processing (C3)

Approximately 85% of steel is assumed to be recycled based on World Steel Association, 2020.

#### - Disposal (C4)

It is assumed that the remaining 5 % of Pre-Coated Metal (PCM) is taken to landfill for final disposal.

#### - Benefits and loads beyond the system boundary (D)

Steel collected and recycled is assumed to replace a value of scrap (GLO).

## Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Galvanized iron	1.046E+00	-	-
Paint	2.632E-02	-	-
Tinner	3.891E-03	-	-
Others	4.267E-03	-	-
TOTAL	1.081E+00	-	-
Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/kg
PE protective film	5.456E-03	-	-
Steel band	1.279E-03	-	-
Outer-ring	8.306E-04	-	-
Others	2.211E-03	-	-
TOTAL	9.777E-03	-	-



## Results of the environmental performance indicators

The environmental performance of the functional unit of 1 metric tonne of PCM(Pre-coated metal) are reported below using the parameters and units as specified in PCR 2019:14.

### Mandatory impact category indicators according to EN 15804+A2 (EF3.1)

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO <sub>2</sub> eq.	3.41E+03	3.48E+00	7.25E+01	6.49E+01	9.11E-01	-1.97E+03
GWP-biogenic	kg CO <sub>2</sub> eq.	3.70E+00	1.28E-01	3.77E-02	2.80E-02	5.22E-04	1.35E-01
GWP-luluc	kg CO <sub>2</sub> eq.	6.73E-01	8.70E-03	3.68E-02	1.27E-02	5.50E-04	-3.13E-01
GWP-total	kg CO <sub>2</sub> eq.	3.41E+03	3.62E+00	7.26E+01	6.50E+01	9.13E-01	-1.97E+03
ODP	kg CFC 11 eq.	4.41E-05	6.25E-08	1.11E-06	1.01E-06	2.64E-08	-7.17E-13
AP	mol H <sup>+</sup> eq.	8.87E+00	1.75E-02	1.76E-01	5.91E-01	6.87E-03	-5.25E+00
EP-freshwater	kg P eq.	1.07E-01	3.17E-03	5.82E-03	3.21E-03	7.59E-05	-7.58E-04
EP-marine	kg N eq.	1.96E+00	3.10E-03	4.18E-02	2.70E-01	2.64E-03	-1.10E+00
EP-terrestrial	mol N eq.	1.96E+01	2.74E-02	4.29E-01	2.93E+00	2.83E-02	-1.08E+01
POCP	kg NMVOC eq.	6.80E+00	8.83E-03	2.28E-01	8.68E-01	9.84E-03	-4.07E+00
ADP-minerals&metals*	kg Sb eq.	1.36E-02	6.92E-06	2.29E-04	3.74E-05	1.27E-06	-1.36E-03
ADP-fossil*	MJ	4.00E+04	8.01E+01	1.00E+03	8.50E+02	2.27E+01	-2.30E+04
WDP	m <sup>3</sup>	-1.66E+04	8.27E-01	4.19E+00	2.23E+00	1.00E+00	4.29E+03
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.

## Additional mandatory and voluntary impact category indicators

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG <sup>1</sup>	kg CO <sub>2</sub> eq.	3.08E+03	6.08E+01	2.67E+02	3.41E+03	3.49E+00	7.26E+01
<i>Additional voluntary indicators e.g., the voluntary indicators from EN 15804 or the global indicators according to ISO 21930:2017</i>							

## Resource use indicators

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	5.02E+02	1.30E+01	1.14E+01	7.97E+00	1.40E-01	4.86E+01
PERM	MJ	5.06E+01	2.34E+00	3.93E+00	1.53E+00	5.47E-02	-5.08E-01
PERT	MJ	5.53E+02	1.54E+01	1.54E+01	9.50E+00	1.94E-01	4.80E+01
PENRE	MJ	8.75E+02	3.98E+01	1.33E+01	1.19E+02	2.39E-01	5.86E+02
PENRM	MJ	3.91E+04	4.02E+01	9.91E+02	8.38E+02	2.25E+01	-1.57E+04
PENRT	MJ	4.00E+04	8.00E+01	1.00E+03	8.50E+02	2.27E+01	-1.51E+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 <sup>3</sup>	2.58E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+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; RE = Recovered energy; FW = Use of net fresh water						

<sup>1</sup> 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 CO<sub>2</sub> is set to zero.

## Waste indicators

Results per functional or declared unit							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.07E-01	2.51E-03	2.35E-02	8.69E-03	2.79E-04	0.00E+00
Non-hazardous waste disposed	kg	6.44E+01	2.20E-01	4.11E+01	1.37E+00	1.50E+02	0.00E+00
Radioactive waste disposed	kg	9.46E-03	5.83E-04	2.06E-04	1.84E-04	3.36E-06	0.00E+00

## Output flow indicators

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	0.00E+00	0.00E+00	0.00E+00	8.50E+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

## Additional environmental information

### 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.

## References

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

PCR 2019:14. Construction products (EN15804:A2). 1.3.3

EN 15804:2012+A2:2019. Sustainability of construction works – Environmental product declarations –

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 9.5.0.1

