



ENVIRONMENTAL PRODUCT DECLARATION

EPD of multiple products, based on a representative product

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

HOT DIP GALVANIZED FLAT STEEL - EAF BASED (HDG 2)

Programme: The International EPD® System, www.environdec.com

Programme Operator: EPD International AB

Licensee: EPD Türkiye

EPD Registration Number: EPD-IES-0015745

Version Date: 2024-10-14

Validity Date: 2029-10-13

Geographical Scope: Global



An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com.

Programme Information

CEN standard EN 15804 serves as the core Product Category Rules (PCR)

Product Category Rules (PCR):

PCR 2019:14 Construction products, version 1.3.4, Construction EN 15804:2012+A2:2019/AC:2021 Sustainability of Construction Works

UN CPC Code: 412

“Products of iron and steel”

PCR review was conducted by: The Technical Committee of the International EPD® System. Review chair: Claudia A. Peña, University of Concepción, Chile

EPDs within the same product category but registered in different EPD programmes 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.

Verification

External and independent (‘third-party’) verification of the declaration and data, according to ISO 14025:2006, via

EPD verification through an individual EPD verification

Third party individual verifier: Stephen Forson, ViridisPride Ltd.

Approved by: The International EPD® System

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

Yes No

LCA practitioner: Yildray Yılmaz & Hüdai Kara -- Metsims Sustainability Consulting

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

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Borçelik Çelik Sanayii Ticaret A.Ş.

“The Biggest Galvanized Steelmaker of Türkiye Offering the Highest Quality”

Jointventure: Borusan – ArcelorMittal

Product Range: Hot-Rolled (Pickled and Oiled) – PO, Cold Rolled Flat Steel – CR,
Hot Dipped Galvanized Flat Steel - HDG

Production Lines: Continuous Pickling Line (CPL), Reversible Mill (RCM 1- RCM 2 - RCM 3), Continuous Galvanizing Line (CGL1), Continuous Galvanizing Line (CGL2), Continuous Galvanizing Line (CGL3), Electrolytic Cleaning Line (ECL), Annealing Line, Skin Pass Mill (SPM), Tension Leveler Line (TLL), Coil Slitting Line (CSL 1-CSL 2), Coil Surface Inspection Line (CSIL)

Capacity: 1.500 Kton Production / 500 Kton Metal Processing Capacity

Total Investment: \$ 530 Million

Customer Portfolio: 750

Number of Employees: 1212



Product Groups	Industry	Capacity	Thickness	Width
Cold Rolled Steel - CR	White Goods, Automotive, Radiator	600 Ktons	0,25 – 3,00 mm	600 – 1.530 mm
Galvanized Rolled Steel HDG	Construction, Automotive, White Goods	900 Ktons	0,25 – 4,00 mm	400 – 1.550 mm
Extragal ® Galvanneal HSLA Steel Dual Phase Rephosphorized Bake Hardening				

Founded in 1990 as the first private and the second largest flat steel manufacturer of Türkiye, Borçelik started its business operations in order to manufacture “cold-rolled steel rolls” in 1994. Following investments realized in the years 1994, 2003 and 2008 at a total investment cost of 530 million USD, Borçelik has increased its manufacturing capacity to 1.5 million tons. Having three cold-rolling and three hot dip galvanized steel lines, Borçelik is the biggest galvanized steel manufacturer of Türkiye offering the highest quality.

Underlying the strong market position of our Company continuing its business operations as a partnership of Borusan and ArcelorMittal, one of the largest steel manufacturers of the world, are such factors as its dynamic workforce, innovative approach, continuous investments realized for self-development and growth, and customer-oriented service and quality approach.

Handling manufacturing operations in its plants having a total area of 240.000 square meters in Gemlik, Borçelik is engaged in manufacturing hot dip galvanized steel, cold-rolled steel and hot-rolled (pickled and oiled) steel. Borçelik manufactures commercial, drawing, deep drawing, extra deep drawing as well as bake-hardening, dual phase, rephosphorized, HSLA (high strength low alloy), high-carbon steels, enameling and structural steel qualities. The Company has a total production capacity of 1.5 million tons (600,000 tons of cold-rolled steel, 900,000 tons of hot-dip galvanized steel) with the Borçelik brand and a metal processing capacity of 500,000 tons with the Kerim Çelik brand.

In addition to the main plant in Gemlik, we have steel service centers (SSCs) in Bursa-NOSAB with a closed area of 20 thousand m² and in Manisa OSB with a closed area of 10 thousand m², which became part of Borçelik after the merger of Kerim Çelik Mamulleri ve İmalat A.Ş. (Kerim Çelik), a Borusan Group company operating as a separate legal entity in 2017, under the roof of Borçelik legal entity. The total metal processing capacity of our SSCs is 500 thousand tons. Our SSCs also sell coated sheets (Galvanil, Galfan, Aluzinc, Alusi), pre-painted sheets and hot rolled sheets (HRC) under the Kerim Çelik brand, which are not produced at the Gemlik plant. We have sales offices in İstanbul and Adana, which sell under the Kerim Çelik brand.

Contact

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About the Product

The investigated product in this EPD is Borçelik's hot dipped galvanized flat steel (HDG) product manufactured at Gemlik/Bursa facility in Türkiye. The thickness of the product varies between 0.25 to 4.00 mm. The representative thickness is selected based on the production volumes. The product is flat steel galvanized by continuous hot dip method. Zinc / galvanized coating is applied on surface of flat steel materials in order to protect them against corrosion. Flat steel is heated and introduced into melt zinc pot, and is bound by establishing a chemical link onto zinc / galvanized coating surface. Galvanized coating provides steel products with corrosion resistance and cathodic protection operations, we are able to meet special demands of end users as well.

Product Name	Hot Dipped Galvanized Flat Steel - HDG
Production Location	Gemlik / Bursa, Türkiye
Capacity	900,000 tons / year
Thickness	0.25 - 4.00 mm
Width	400 - 1,500 mm
Coating Thickness (Double side)	50 - 600 gr / m ²
Product Type	Coil, Slitted-Coil, Sheet



About the Product

This EPD is specific to Borçelik's hot dip galvanized flat steel produced through EAF route. The main material input is hot rolled coil provided through different suppliers. This EPD is prepared to specifically address the production where hot rolled coil is supplied through companies that operate electric arc furnaces. Other production route (BOF) of the same product is covered under a different EPD.

Below table list the required materials for the final product and its packaging with their weight percentages. The allocation for post-consumer materials is based on the conservative estimates according to the production location of the supplied steel.

Material	Weight (%)	Post-consumer material weight- %	Biogenic material kg C / declared unit
Hot rolled coil	>99.0	95.6	0
Others (additives)	<1.0	0	0
Sum	100	95.6	0
Packaging material	Weight (%)	Post-consumer material weight- %	Biogenic material kg C / declared unit
Steel hoop, sheet etc.	85	0	0
Kraft paper	7.1	0	0.074
PP plate & sheet	6.7	0	0
Hardboard MDF	0.66	0	0.004
Sum	100	0	0.078



System Boundary

A1 Raw Material Supply

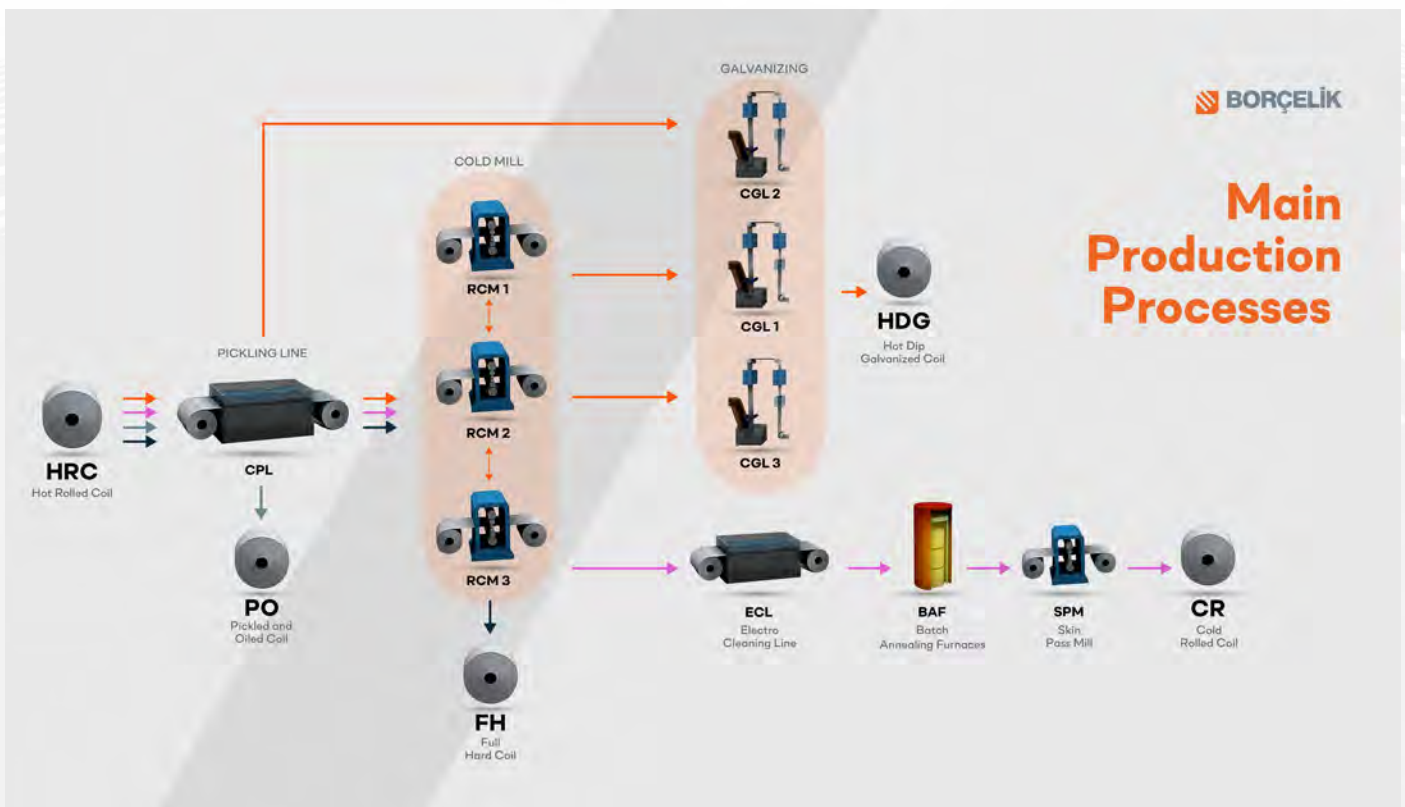
This stage includes raw materials extraction and pre-treatment processes before the production. The main material used in the production of cold rolled flat steel is pickled and oiled hot rolled coil. In addition, during the production some chemicals, additives, and oils are also used. Environmental impacts of these materials are considered in this stage.

A2 Transport

This stage is relevant for the delivery of raw materials to the production plant and within the plant. Both highway and seaway transportation is involved. Transport routes and distances are supplier-specific and provided by the manufacturer.

A3 Manufacturing

Manufacturing-related activities are considered at this stage along with the impact of packaging materials. The incoming hot-rolled coil goes through CPL (coil pickling line) to manufacture pickled and oiled coil. During the manufacturing processes, electricity, natural gas, steam and pressurized air are consumed.



System Boundary

A4 Transport

This stage is relevant for the shipments of the final product to the customers and intended markets. Both highway and seaway transportation is involved. Transport routes and distances are supplier-specific and provided by the manufacturer.

A5 Installation

This stage includes the end of life impacts of packaging materials.

C1 Deconstruction / Demolition

This stage includes the impacts arise during the deconstruction / demolition of hot dip galvanized steel from its intended use areas. It is assumed that no energy and additional material are needed at this stage.

C2 Waste Transport

This stage includes the transportation of discarded products to the waste processing/disposal area. 100 km distance by trucks is assumed.

C3 Waste Processing

According to the JRC report, Annex C V.2.1, end-of-life coefficients are used. After accounting the losses, remaining 95% of the steel is assumed recycled and the rest is landfilled.

C4 Disposal

Impact of percentage of material that do not go to recycling scheme are included at this stage.

D Future reuse, recycling or energy recovery potentials

As sector practice, the recycled steel can substitute the use of pig iron content for further steel making processes. However, since the steel used in this EPD is sourced 100% through EAF route, there is no benefit allocated to this stage.

LCA Information

Declared Unit

1 tonne of hot dip galvanized flat steel produced through EAF-routed.

System Boundary

Cradle to gate with options, modules C1–C4, module D and with optional modules (A4 & A5).

Cut-Off Rules

The criteria for exclusion were set so that individual input flows less than 1% of the total, with a cumulative limit of less than 5%, could be omitted. This was contingent upon confirming that these excluded flows did not significantly alter the reported data, with “significant” defined as affecting the total by less than 5%.

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage			Benefits and Loads	
	Raw Material Supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction / Demolition	Transport	Waste Processing	Disposal	Future reuse, recycling or energy recovery potentials
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules Declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	TR	GLO	GLO	-							GLO	GLO	GLO	GLO	GLO
Specific Data Used	16%					-											
Variation - Products	0%					-											
Variation - Sites	0%					-											

(X = Module declared, ND = Not declared, TR = Türkiye, GLO = Global)

LCA Information

REACH Regulation

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

Background Data

For all LCA modelling and calculation, Ecoinvent database (v3.10) and SimaPro (v9.6) LCA software were used. Characterization factors of EN 15804 reference package based on EF 3.1 are utilized. Impact of infrastructure and capital goods are excluded from the analysis.

LCA Modelling, Calculation and Data Quality

The results of the LCA with the indicators as per EPD requirements are given in the LCA result tables. All energy calculations were obtained using Cumulative Energy Demand (LHV) methodology, while freshwater use is calculated with selected inventory flows in SimaPro according to the PCR. There are no co-product allocations within the LCA study underlying this EPD. The regional energy datasets were used for all energy calculations.

Period Under Review

The data used for LCA study concerns the year 2023.

Source of Electricity

The modeled electricity data for the manufacturing of hot dip galvanized flat steel is taken from ecoinvent 3.10 database which has carbon density of 0.575 kg CO₂ eq. / kWh for medium voltage electricity production. The selected electricity data consists of around 35% electricity production from hard coal and lignite, 29.2% hydro, 19.4% natural gas, 9.4% wind, 3.5% geothermal, 1.2% co-generation from natural gas, 1.1% biogas and around 1.2% from various other sources.

Allocations

Energy consumption and raw material transportation were weighted according to 2023 production figures. In addition, hazardous and non-hazardous waste amounts were also allocated from the total waste generation in 2023. For end of life allocation, Annex C version 2.1 (May 2020) of JRC report is utilized to determine the final fate (recycling, landfilling, incineration etc.) of materials and their percentages.

Assumptions

Upstream and downstream road transportation are assumed to be carried out with Euro5 motor vehicles with a size class of > 32 metric tonnes where distances acquired through Google Maps. In addition, 100 km distance for the waste transport at C2 stage is assumed.

LCA Results

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. The results of this EPD should not be used without the consideration of Module C.

Core environmental impact indicators (Mandatory)	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - Fossil	kg CO ₂ eq.	1.01E+03	3.95E+01	3.80E-02	0.00E+00	1.04E+01	0.00E+00	2.11E+00	0.00E+00
GWP - Biogenic	kg CO ₂ eq.	1.22E+00	6.94E-03	2.88E-01	0.00E+00	1.93E-03	0.00E+00	2.61E-01	0.00E+00
GWP - Luluc	kg CO ₂ eq.	4.10E+00	2.32E-02	8.44E-06	0.00E+00	4.34E-03	0.00E+00	1.08E-03	0.00E+00
GWP - Total	kg CO ₂ eq.	1.01E+03	3.95E+01	3.26E-01	0.00E+00	1.04E+01	0.00E+00	2.37E+00	0.00E+00
ODP	kg CFC-11 eq.	9.86E-06	5.81E-07	5.41E-10	0.00E+00	1.67E-07	0.00E+00	6.06E-08	0.00E+00
AP	mol H+ eq.	4.58E+00	7.97E-01	1.64E-04	0.00E+00	2.65E-02	0.00E+00	1.49E-02	0.00E+00
EP - Freshwater	kg P eq.	5.49E-01	1.92E-03	2.17E-07	0.00E+00	8.42E-04	0.00E+00	2.69E-05	0.00E+00
EP - Marine	kg N eq.	1.04E+00	1.82E-01	6.92E-05	0.00E+00	6.72E-03	0.00E+00	6.05E-03	0.00E+00
EP - Terrestrial	mol N eq.	1.00E+01	2.03E+00	7.26E-04	0.00E+00	7.28E-02	0.00E+00	6.19E-02	0.00E+00
POCP	kg NMVOC	3.77E+00	5.83E-01	2.38E-04	0.00E+00	4.01E-02	0.00E+00	2.22E-02	0.00E+00
*ADPE	kg Sb eq.	1.27E-03	6.30E-05	3.52E-08	0.00E+00	2.93E-05	0.00E+00	3.28E-06	0.00E+00
*ADPF	MJ	5.05E+03	3.37E+01	3.13E-02	0.00E+00	1.48E+01	0.00E+00	3.20E+00	0.00E+00
*WDP	m ³ depriv.	7.94E+02	1.73E+00	1.51E-02	0.00E+00	7.99E-01	0.00E+00	2.16E+00	0.00E+00
Additional environmental impact indicators (Mandatory)									
**GWP-GHG	kg CO ₂ eq.	1.01E+03	3.96E+01	3.83E-02	0.00E+00	1.04E+01	0.00E+00	3.37E-07	0.00E+00
Additional environmental impact indicators (Optional)									
PM	disease inc.	8.77E-05	1.86E-06	2.95E-09	0.00E+00	1.02E-06	0.00E+00	2.53E-07	0.00E+00
***IR	kBq U-235 eq.	2.60E+01	3.28E-01	1.48E-04	0.00E+00	1.38E-01	0.00E+00	2.48E-02	0.00E+00
ETP-FW	CTUe	7.76E+03	1.07E+02	1.70E-01	0.00E+00	3.76E+01	0.00E+00	8.83E+00	0.00E+00
*HTP - C	CTUh	1.40E-05	1.98E-07	1.33E-10	0.00E+00	5.34E-08	0.00E+00	7.11E-09	0.00E+00
*HTP - NC	CTUh	2.29E-05	1.90E-07	5.99E-10	0.00E+00	1.00E-07	0.00E+00	8.26E-09	0.00E+00
*SQP	Pt	1.59E+03	1.82E+02	7.91E-01	0.00E+00	1.57E+02	0.00E+00	7.58E+01	0.00E+00
Acronyms	GWP-total: Climate change, GWP-fossil: Climate change- fossil, GWP-biogenic: Climate change - biogenic, GWP-luluc: Climate change - land use and transformation, ODP: Ozone layer depletion, AP: Acidification terrestrial and freshwater, EP-freshwater: Eutrophication freshwater, EP-marine: Eutrophication marine, EP-terrestrial: Eutrophication terrestrial, POCP: Photochemical oxidation, ADPE: Abiotic depletion - elements, ADPF: Abiotic depletion - fossil resources, WDP: Water scarcity, PM: Respiratory inorganics - particulate matter, IR: Ionising radiation, ETP-FW: Ecotoxicity freshwater, HTP-c: Cancer human health effects, HTP-nc: Non-cancer human health effects, SQP: Land use related impacts, soil quality.								
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A4: Transport, A5: Installation, C1: Demolition, C2: Waste Transport, C3: Waste Processing, C4: Disposal, D: Future reuse, recycling or energy recovery potentials.								

LCA Results

Indicators describing resource use (Mandatory)	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	2.06E+03	5.00E+00	2.91E+00	0.00E+00	1.99E+00	0.00E+00	3.49E-01	0.00E+00
PERM	MJ	2.90E+00	0.00E+00	-2.90E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	2.06E+03	5.00E+00	5.89E-03	0.00E+00	1.99E+00	0.00E+00	3.49E-01	0.00E+00
PENRE	MJ	1.12E+04	5.11E+02	6.16E+00	0.00E+00	1.56E+02	0.00E+00	3.85E+01	0.00E+00
PENRM	MJ	5.74E+00	0.00E+00	-5.74E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.12E+04	5.11E+02	4.24E-01	0.00E+00	1.56E+02	0.00E+00	3.85E+01	0.00E+00
SM	kg	1.04E+03	0.00E+00	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	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	0.00E+00	0.00E+00
FW	m ³	1.23E+01	5.75E-02	5.28E-04	0.00E+00	2.96E-02	0.00E+00	4.00E-02	0.00E+00
Acronyms	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy, PENRE: Use of non-renewable primary energy excluding 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, SM: Secondary material, RSF: Renewable secondary fuels, NRSF: Non-renewable secondary fuels, FW: Net use of fresh water								
Environmental information describing waste categories (Mandatory)	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	6.42E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.00E+01	2.28E+02	0.00E+00
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Environmental information describing output flow (Mandatory)	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	4.43E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.22E+02	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE (Electric)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE (Thermal)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acronyms	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for reuse, MFR: Material for recycling, MER: Materials for energy recovery, EE (Electrical): Exported energy electrical, EE (Thermal): Exported energy thermal.								
*Disclaimer 1	The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.								
*Disclaimer 2	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology. 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. The GWP-GHG indicator is identical to GWP-total except that the characterisation factor (CF) for biogenic CO2 is set to zero.								
*Disclaimer 3	This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.								

References

ISO 9001:2015/ Quality Management Systems

ISO 50001:2018/ Energy Management Systems

GPI/ General Programme Instructions of the International EPD® System. Version 5.0.

ISO 14020:2000/ Environmental Labels and Declarations — General principles

EN 15804:2012+A2:2019/AC:2021 Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products

ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures

ISO 14040/44/ DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO14040:2006) and Requirements and guidelines (ISO 14044:2006)

PCR for Construction Products and Construction Services/ Prepared by IVL Swedish Environmental Research Institute, Swedish environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2019:14 Version 1.3.4.

The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025. www.environdec.com

Ecoinvent / Ecoinvent Centre, www.ecoinvent.org

SimaPro/ SimaPro LCA Software, Pré Consultants, the Netherlands, www.pre-sustainability.com

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