

Environmental Product Declaration

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



Semi-Finished Products (Billets, Blooms and Beam-Blanks)

from

SULB Company B.S.C Closed



Programme:	The International EPD System, www.environdec.com
Programme operator:	EPD International AB
Licensee:	EPD CLC MENA
Type of EPD:	EPD of multiple products, based on the average results of the product group.
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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



GENERAL INFORMATION

Programme Information	
Programme:	The International EPD System
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Website:	www.environdec.com
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Regional Programme	EPD CLC MENA region Dr. Nasser Ayoub Director of CLC EPD MENA

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 2.0.1 published on 2025.06.05.
PCR review was conducted by: The Technical Committee of the International EPD System. See www.envirodec.com for a list of members. The review panel may be contacted via support@environdec.com . Review chair: Rob Rouwette, Co-chair: Noa Meron

Third-party Verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:
<input checked="" type="checkbox"/> Individual EPD verification without a pre-verified LCA/EPD tool Third-party verifier: Vijay Thakur Approved by: International EPD System
Procedure for follow-up of data during EPD validity involves third party verifier:
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

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

EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit 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 identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.

For further information about comparability, see EN 15804 and ISO 14025.

INFORMATION ABOUT EPD OWNER

Owner of the EPD: SULB Company B.S.C Closed

Address: P.O. Box 50177, Al Hidd Industrial Area, Kingdom of Bahrain

Contact: Robert East, Quality Assurance Manager

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Address and contact information of the LCA practitioner commissioned by the EPD owner:

Vikas Upadhyay, sentra.world technologies private limited No. 421/M, Shri Krishna Temple Road, Indiranagar 1st Stage, Indiranagar, Bangalore, Bangalore North, Karnataka, India, 560038.

Contact: +91 9343622813, vikas.upadhyay@sentra.world

Description of the organisation: SULB Company B.S.C. Closed is a leading producer of high-quality structural steel products, specializing in a wide range of medium and heavy sections. The company operates a fully integrated steel plant located in Bahrain, with a total investment of \$1.4 billion.

The SULB Bahrain facility, situated in Hidd, spans an area of 347,342 m² and has a production capacity of over 600,000 metric tons of hot-rolled structural steel sections per year (t/y). The plant benefits from having its own wharf providing direct access for exporting finished products to international markets. This location is strategically positioned in the 'home of steel' in Bahrain, ensuring efficient access to global markets through advanced logistics networks, including road connections to Saudi Arabia via the King Fahd Causeway.

SULB's strategic positioning within the **Gulf Cooperation Council (GCC)** has enabled the company to meet the growing demand for structural steel in the region. Over the last decade, the GCC has seen a substantial increase in construction activity, offering more than **\$2 trillion** in opportunities, which SULB is well-equipped to supply.

In addition to its Bahrain operations, SULB operates a second plant in **Jubail, Saudi Arabia**, established in **2011**. This plant specializes in the production of **light to medium sections** and has a capacity of **450,000 metric tons per year**. The combined capacity of SULB's Bahrain and Saudi Arabia plants supports the company's ability to serve the growing regional demand for high-quality steel.

With a combined annual production capacity of one million metric tons of hot rolled structural steel sections, SULB Bahrain and SULB Saudi Arabia is ideally positioned to serve the expanding infrastructure and construction sectors in the region.

Name and location of production site(s): SULB Company B.S.C. Closed, Building 277, Road 17, Block 117, Hidd Industrial Area, Kingdom of Bahrain.

Product Description and Representativeness: This Environmental Product Declaration (EPD) covers steel billets, blooms and beam-blanks produced by SULB Company B.S.C. (Closed) during the 2024–25 reporting period. Environmental performance results are based on a production mass-weighted average across all billet, bloom and beam-blank grades manufactured using both Hot DRI (HDRI) and Cold DRI (CDRI) feedstock, with minor additions of recycled scrap. Billets, blooms and beam-blanks are semi-finished steel products produced through the Electric Arc Furnace – Ladle Furnace – Continuous Casting Machine (EAF–LF–CCM) route and serve as feedstock for rolling mills or are sold for further processing. This declaration provides a representative cradle-to-gate environmental profile for 1 tonne of steel billets, blooms and beam-blanks produced at SULB's integrated Meltshop facility.

PRODUCT INFORMATION

Product name: Semi-Finished Products (Billets, Blooms and Beam-Blanks)

Product description:

The Meltshop at SULB Company B.S.C. (Closed), located in the Hidd Industrial Area, Kingdom of Bahrain, manufactures a range of Semi-Finished Products which are characterized by their specific cross-sectional dimensions and serve as the raw material for manufacturing various finished steel shapes such as Beams, Columns, Angles and Channels. This Environmental Product Declaration (EPD) specifically covers the production of Semi-Finished Products (Billets, Blooms and Beam-Blanks), which serve as feedstock for rolling mills or are supplied directly to domestic and export markets as intermediate products.

Product Forms

SULB produces semi-finished products with the following standard cross-sectional dimensions:

- **Billets:**
 - 150 mm × 150 mm
- **Blooms:**
 - 200 mm × 200 mm (BL1)
 - 200 mm × 280 mm (BL2)
- **Beam-Blanks:**
 - 245 mm × 350 mm × 80 mm (BB1)
 - 440 mm × 492 mm × 100 mm (BB2)
 - 350 mm × 680 mm × 100 mm (BB3)

Manufacturing Process Overview

The billets, blooms and beam-blanks are manufactured in SULB's fully integrated Meltshop, designed by SMS Concast, with a design capacity of 0.97 million tonnes per year and operating at an annualized output of ~1.3 million tonnes. The facility consists of:

- A **130-ton Electric Arc Furnace (EAF)** for primary melting
- A **Ladle Furnace (LF)** for secondary refining
- A **four-strand Continuous Casting Machine (CCM)** for semi-finished product casting

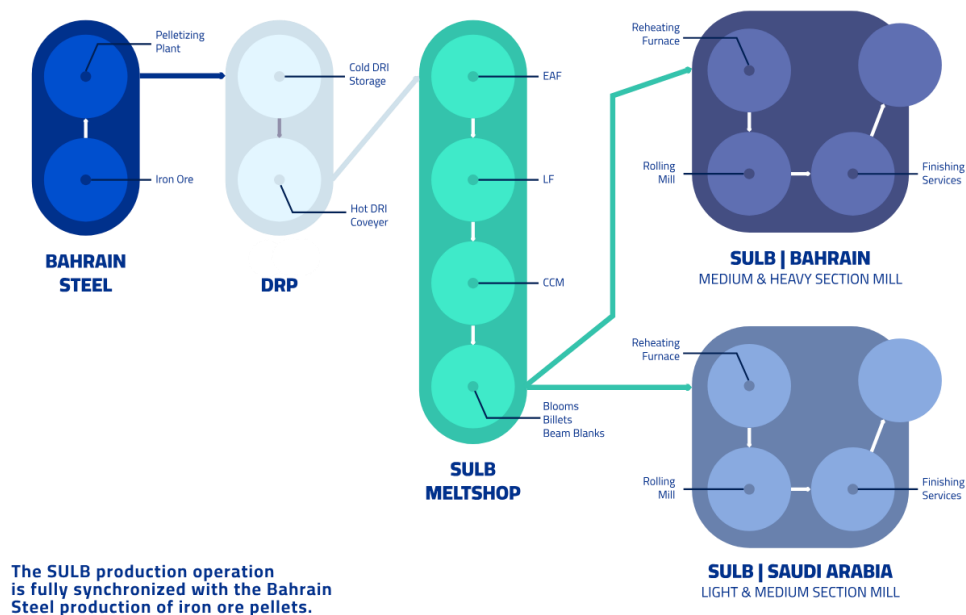


Fig: Process Flow

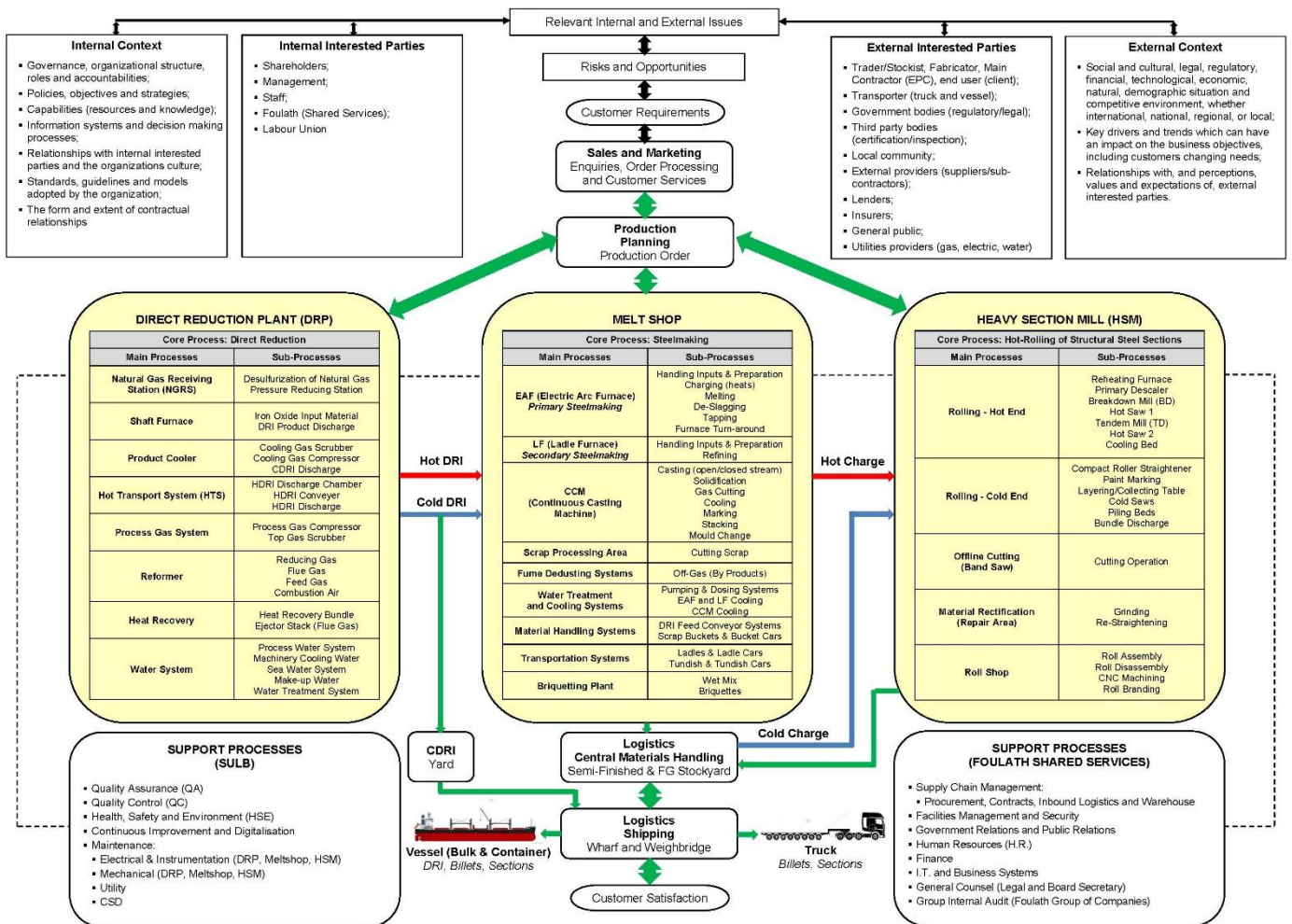


Fig: Detailed Process Flow-Chart

The Meltsop is equipped with advanced fume extraction, closed-loop cooling systems, slag handling infrastructure, and high-precision metallurgical control systems to ensure consistent product quality and reduced environmental impacts.

The billets, blooms and beam-blanks production process comprises the following main steps:

1. Charge Preparation and Melting (Electric Arc Furnace)

- The primary metallic feedstock for billet production consists of Direct Reduced Iron (DRI)—received in both Hot DRI (HDRI) and Cold DRI (CDRI) forms—supplemented by a small fraction of internally recycled plant scrap.
- HDRI is received at elevated temperature from Midrex-based DRI production unit, which reduces the electrical energy demand during melting.
- CDRI is supplied from storage or external vendors and used as required to balance the charge mix.
- All charge materials are fed into a 130-ton Electric Arc Furnace (EAF), where electrical energy and graphite electrodes are used to melt the metallic inputs.
- Fluxes such as lime and dolomite are added to facilitate slag formation and impurity removal.
- Oxygen lancing and natural gas burners support melting efficiency and decarburization.
- This stage yields molten steel (“heat”), which is then tapped into a ladle for secondary refining.



Fig: Direct Reduced Iron (DRI)

2. Secondary Refining (Ladle Furnace)

Molten steel is refined in a Ladle Furnace (LF) to fine-tune temperature and chemistry.

- Alloying elements (ferroalloys) are added to meet specific grade requirements.
- Slag conditioning ensures removal of inclusions and improved cleanliness.
- The LF also serves as a buffer between the EAF and casting operations, allowing smooth sequencing and improved productivity. This results in high-quality liquid steel suitable for casting into billets or other semi-finished forms.

3. Continuous Casting (CCM)

The refined molten steel is transferred to a four-strand Continuous Casting Machine (CCM).

- Steel flows from the ladle into a tundish, which evenly distributes it to the casting moulds.
- As steel solidifies in the water-cooled mould, it forms strands of semi-finished product.
- The partially solidified strands are straightened, torch-cut, and stamped with unique heat numbers for traceability.
- Finished billets are either hot-charged to the Heavy Section Mill (HSM) or air-cooled and stored for later use or export.



Fig: Meltshop Continuous Casting Machine (CCM)

4. Process Control and Environmental Systems

- Dust and fume extraction systems (bag filters and hoods) control emissions from the EAF and LF.
- Closed-loop water systems are used for cooling and slag handling, minimizing freshwater consumption.
- Solid residues, such as slag, mill scale, and dust, are recycled internally or sent for external recovery wherever feasible.

Each production heat is tracked from melting to casting through a unique heat number, ensuring full traceability of chemical and mechanical properties.

Chemical Composition of Product

Component	Max %	Min %
C	0.26	0.09
Si	0.25	0.15
Mn	1.65	0.50
P	0.050	0.000
S	0.015	0.000
N	0.010	0.000
Cu	0.030	0.000
Ni	0.010	0.000
Cr	0.035	0.000
Mo	0.010	0.000
Nb	0.015	0.000
V	0.080	0.000
Ti	0.005	0.000
Al	0.025	0.000
Sn	0.008	0.000
B	0.0008	0.0000

Content Declaration

Product components in 1 tonne of Billets, Blooms and Beam-Blanks	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Metal	999.73	-	-
Ferro Alloys	0.27	-	-
TOTAL	1000	-	-

The products do not contain any of the substances of very high concern (SVHC) regulated by the Regulation (EC) No 1907/2006 (REACH) or the Regulation (EC) No 1272/2008 of European parliament.

LCA INFORMATION

Declared unit: 1 Tonne Semi-Finished Products (Billets, Blooms and Beam-Blanks)

Reference service life: Not Applicable

Time representativeness: The collection of the foreground data refers to the year July 2024 – June 25.

Environmental Impact Assessment Method: EN15804 reference package EF 3.1 characterization method.

Database(s) and LCA software used: The background data has been taken from the ecoinvent 3.10 database and modelled by using SimaPro software version 10.2.0.1.

UN CPC code: 412 Products of Iron or Steel.

Geographical scope: Global

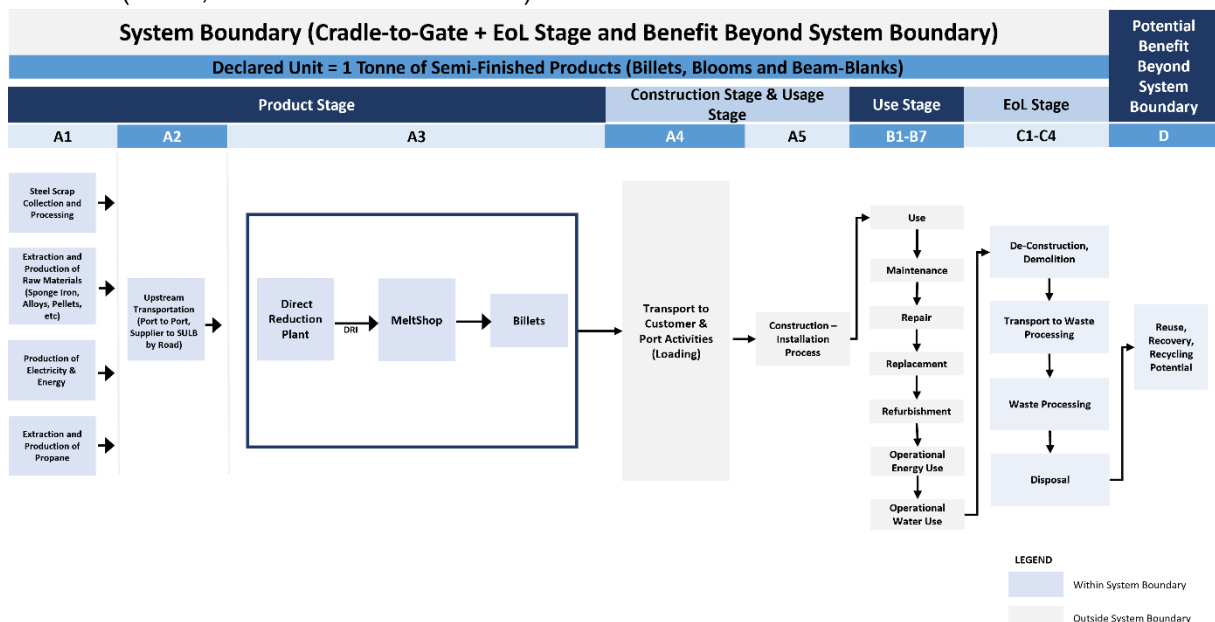
Data quality assessment:

The data quality assessment has been calculated based on GPI Version 5.0.1 (A 5.3) published in 2025. The total share of primary data of GWP-GHG results for A1-A3 is more than 69% (The table showing the calculation, aligned with GPI V 5.0.1 standards is detailed in additional information following the EPD results).

Description of system boundaries: Cradle-to-gate with modules C1-C4 and module D of LCA of 1 Tonne Semi-Finished Products (Billets, Blooms and Beam-Blanks)

The study is a Cradle- to-Gate LCA study with End-of-life credit Steel Billets. It covers the stages from production of raw materials to the End of Life of the product, excluding the use phase of the product. The scope covers the ecological information to be divided into raw material production (A1), inbound transportation (A2), Manufacturing (A3), Deconstruction and demolition (C1), transport of dismantled products to EoL site (C2), waste processing (C3), disposal (C4) as well as the end-of-life stage recycling (D) considerations.

System diagram: Cradle-to-gate with modules C1-C4 and module D of LCA of 1 Tonne Semi-Finished Products (Billets, Blooms and Beam-Blanks)



A1 – Raw Material Supply

Module A1 includes the extraction, processing, and upstream transport of all raw materials, energy carriers, and auxiliary inputs used for billet production. Main inputs are Hot and Cold DRI, internal and external scrap, ferroalloys, lime and dolomite, refractory and consumable materials (graphite electrodes, mould powders, lubricants), electricity, natural gas, and process water. All upstream impacts from material and energy production are included.

A2 – Transport

Module A2 covers the transportation of raw materials and fuels to the Meltshop. This includes conveying of Hot DRI from the adjacent DRI plant, road and sea transport of Cold DRI, scrap, alloys, and fluxes, and pipeline delivery of natural gas. Internal handling between the DRI plant, EAF, LF, and CCM is also included.

A3 – Manufacturing

Module A3 includes all on-site processes converting DRI and scrap into semi-finished billets. The process involves melting in the Electric Arc Furnace (EAF), refining in the Ladle Furnace (LF), and casting in the Continuous Casting Machine (CCM). All energy and material inputs, direct emissions, waste handling, and internal recycling (e.g., slag and scale recovery) are included.

Packaging Material: No packaging used for the products

Product End of life (C1-C4, D):

C1 : Deconstruction/Demolition

- Process: Selective demolition and Billets recovery.
- Inventory driver: Diesel for demolition equipment.
- Quantity: 1.1 kWh diesel per tonne of material handled (applied to the Billets mass attributed to the product at EoL).
- Dataset mapping (SimaPro/Ecoinvent): model as diesel combustion in non-road equipment (e.g., *“diesel, burned in building machine”*), using 1 kWh = 3.6 MJ for energy input.

C2 : Transport to waste processing

- It is assumed that 100% of the waste is collected and transported to the waste treatment centre.
- Scenario: Transport from demolition site to metal sorting / scrap yard.
- Mode: 16–32 t lorry (EURO 5), 50% load factor.
- Distance: 80 km (non-incineration route; steel does not go to incineration).
- Dataset mapping: *“transport, freight, lorry 16–32 t, EURO5”* (tkm).

C3 : Waste processing for recycling (steel)

- Approximately 85% of steel is assumed to be recycled based on World Steel Association, 2020.
- Mechanical sorting: 2.2 kWh electricity / t
- Dataset mapping:
- Electricity uses grid electricity at appropriate geography (kWh).

C4 : Disposal

- Scenario: Steel to recycling; landfill fraction = 15% for the steel itself.
- Compacting of inert waste for landfill: 1.6 kWh diesel / t (only to the non-recyclable steel fraction).

D : Reuse, Recovery, Recycling Potential

Steel is 100% recyclable, with an 85% recoverability rate per World Steel Data, which is used for EoL credit. This credit accounts for the recycling burden and the replacement of virgin steel. Declared benefits and loads from net secondary material flows are included, excluding co-product allocations.

Metals reach the end-of-waste state after sorting and shredding. Phase D covers treatment, net benefits, and recycling potential for net scrap.

Infrastructure/capital goods: There are no infrastructure and capital goods considered by the LCA study.

Electricity: The Electricity Grid considered for all phases A1-A3, C1-C4 and D is country- specific Bahrain (national generic background data). It was chosen according to the plant location.

The emission factor for the GWP-GHG indicator associated with the High-voltage Bahrain grid electricity is 0.608 kg CO₂ eq./kWh. The modelling has been performed using the ecoinvent 3.10 database within SimaPro software version 10.2.0.1.

Cut-off Criteria were set out in the original study for the recording of material flows and to avoid the need to pursue trivial inputs/outputs in the system. These are outlined below:

1. All energetic inputs to the process stages were recorded, including heating fuels and electricity.
2. The sum of the excluded material flows must not exceed 5% of mass, energy, or environmental relevance. However, in reality at least 99% of material inputs to each process stage were included.
3. Wastes representing less than 1% of total waste tonnage for given process stages were not recorded unless treated outside of the site.
4. Supporting activities directly associated with production at site are included.
5. The period for which inputs to and outputs from product system are accounted for should be 100 years from the reference year of the LCA model.
6. Includes all **elementary flows** to/from the environment within declared modules (**A1–A3, C1–C4**): raw-material extraction and energy inputs (scrap/DRI, alloys, fuels, electricity, water, oxygen) and outputs (emissions to air/water/soil, wastes/residues to treatment or disposal). **Module D** benefits/loads are reported separately. Items allowed by the PCR to be excluded (e.g., **capital goods, office/personnel**) are **outside** this boundary. Cut-off criteria maintained.
7. Minor auxiliary materials used in the Meltshop (e.g., aluminium wire, cored wires, selected ferroalloys, mould fillers, and mould powders) were excluded from the LCA, as each contributes less than 1% of the total mass and does not materially influence the environmental results, in accordance with the PCR cut-off criteria

Allocation:

- Primary data was allocated using the mass allocation approach.
- Mass allocation has been applied across all output streams from the Direct Reduction Plant (DRP). Based on the total production mass, the burdens are distributed as follows: Hot DRI (to Meltshop) – 81.2 %, Cold DRI (to Meltshop) – 6.0 %, Cold DRI (Market) – 11.9 %, Oxide Fines (Market) – 0.6 %, and Oxide Fines (Recycled to DRP) – 0.3 %.
- Mass allocation has been applied to distribute the total burdens of the Meltshop across all output streams. The burdens are allocated as follows: Billets and Blooms (Market) – 41.313 %, Blooms and Beam-Blanks (to Heavy Section Mill) – 57.965 %, Crop Ends – 0.053 %, Scrap – 0.422 %, and Caster Scale – 0.247 %.
- Module D reports only the EoL recycling benefits for the fraction of the product assumed to be collected and recycled at end of life (per the EoL scenario). Consumed scrap benefits are subtracted from the phase D.

Data quality

- The **selection of data and the data quality requirements** have been provided according to the requirements of **BS EN 15941:2024**.

- Manufacturing data of the **period 01/07/2024 – 30/06/2025** has been provided by **SULB Company B.S.C Closed, Bahrain** operating on the geographical area noted in Manufacturing Site.
- A brief description of technology and inputs for the product is given in Manufacturing Process and in simplified Process Flow Diagram.
- All the **primary data** was collected for **whole year July 2024- June 2025**. Primary data collected using data collection questionnaires and was used for the study and for processes modelling by using ecoinvent 3.10 database.
- Used **background data** are of recognised prestige and acceptance in the technical and scientific fields. In particular, the **Ecoinvent 3.10 database**, in the most recent version existing at the time of the study, is considered to be of preferential use.
- **Generic data** were collected from global average data. Data quality for both specific and generic data was sufficient to conduct life cycle assessment in accordance with the defined goal and scope.
- There wasn't any data from different LCI/LCA databases used considering that the overall consistency of the study has not been adversely affected.
- Schemes applied for data quality assessment were as per EN 15804:2012+A2:2019, Annex E, Table E.1 — Data quality level and criteria of the UN Environment Global Guidance on LCA database development. Geographical Representativeness: Good, Technical Representativeness: Very good and Time Representativeness: Very good

Declaration of data sources, reference years, data categories, and share of primary data based on EN 15941

Process	Data Source	Source of emission factor	Reference Year	Data Category	GWP-GHG results for A1-A3 (%)
Electricity consumed	Database	Ecoinvent 3.10	2024	Primary	30.64%
Road Transportation	Database	Ecoinvent 3.10	2024	Primary	0.00%
Sea Transportation	Database	Ecoinvent 3.10	2024	Primary	0.01%
CO2 emission through flue gas stack	Database	Ecoinvent 3.10	2024	Primary	38.48%
Total share of primary data, of GWP-GHG results for A1-A3					69.13%



Fig: Semi-Finished Products

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	BH/ GLO	BH/ GLO	BH	-	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Share of Specific data used	69.13%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<5%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

• BH: BAHRAIN and GLO: GLOBAL



Fig: Semi-Finished Products

Environmental Performance

LCA results of the product(s) - main environmental performance 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 the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).

Mandatory impact category indicators according to EN 15804

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.36E+03	3.97E-01	1.53E+01	1.18E+01	5.77E-01	-1.09E+03
GWP-fossil	kg CO ₂ eq.	1.36E+03	3.97E-01	1.53E+01	1.17E+01	5.77E-01	-1.09E+03
GWP-biogenic	kg CO ₂ eq.	9.59E-01	4.34E-05	4.47E-04	1.18E-01	6.31E-05	-3.98E+00
GWP-luluc	kg CO ₂ eq.	3.23E-01	3.45E-05	6.23E-03	2.25E-02	5.01E-05	-8.37E-01
ODP	kg CFC 11 eq.	3.26E-05	6.07E-09	2.27E-07	5.06E-08	8.83E-09	6.40E-07
AP	mol H ⁺ eq.	4.01E+00	3.58E-03	3.51E-02	5.98E-02	5.21E-03	-5.99E+00
EP-freshwater	kg P eq.	5.58E-02	1.16E-05	1.21E-03	2.15E-02	1.69E-05	-5.83E-01
EP-marine	kg N eq.	9.82E-01	1.66E-03	8.16E-03	1.66E-02	2.42E-03	-1.47E+00
EP-terrestrial	mol N eq.	1.12E+01	1.82E-02	8.81E-02	1.33E-01	2.64E-02	-1.25E+01
POCP	kg NMVOC eq.	4.30E+00	5.42E-03	4.92E-02	3.70E-02	7.89E-03	-3.89E+00
ADP-minerals&metals*	kg Sb eq.	1.16E-03	1.42E-07	5.01E-05	6.45E-06	2.06E-07	-4.11E-03
ADP-fossil*	MJ	2.33E+04	5.19E+00	2.15E+02	1.22E+02	7.55E+00	-9.66E+03
WDP*	m ³	6.48E+01	1.12E-02	9.81E-01	1.60E+00	1.64E-02	-5.32E+02

* Disclaimer: 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.

Additional mandatory and voluntary impact category indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease inc.	3.40E-05	1.02E-07	1.14E-06	8.96E-07	1.48E-07	-1.48E-04
Human toxicity, cancer²	CTUh	4.14E-06	1.55E-09	8.06E-08	7.16E-09	2.26E-09	-4.52E-05
Human toxicity, non-cancer²	CTUh	2.97E-06	6.42E-10	1.35E-07	9.61E-08	9.34E-10	-9.16E-05

Ionising radiation ¹	kBq U-235 eq	1.02E+01	2.33E-03	1.79E-01	2.30E-02	3.38E-03	-6.10E+01
Land use ²	Pt	1.36E+03	3.65E-01	1.30E+02	2.58E+00	5.31E-01	-4.08E+03
Ecotoxicity, freshwater ²	CTUe	3.14E+03	5.72E-01	4.21E+01	3.84E+00	8.32E-01	-2.61E+04

1 – 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.

2 – 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 experience with the indicator.

Additional mandatory and voluntary impact category indicators

Impact category	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG	kg CO2 eq	1.36E+03	3.97E-01	1.53E+01	1.18E+01	5.77E-01	-1.09E+03

Resource use indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	2.16E+02	3.09E-02	2.75E+00	9.63E+00	4.50E-02	-1.02E+03
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	2.16E+02	3.09E-02	2.75E+00	9.63E+00	4.50E-02	-1.02E+03
PENRE	MJ	2.33E+04	5.19E+00	2.15E+02	1.22E+02	7.55E+00	-9.66E+03
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.33E+04	5.19E+00	2.15E+02	1.22E+02	7.55E+00	-9.66E+03
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	2.83E+00	3.71E-04	2.97E-02	4.45E-02	5.40E-04	-1.78E+01

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.

Waste indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	Kg	1.78E-01	4.73E-05	5.47E-03	1.28E-02	6.89E-05	-5.40E-01
Non-hazardous waste disposed	Kg	5.74E+01	3.17E-03	1.03E+01	2.43E-01	1.50E+02	-2.19E+02
Radioactive waste disposed	Kg	2.46E-03	5.70E-07	4.38E-05	5.32E-06	8.30E-07	-1.49E-02

Output flow indicators

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 LCA results - 100% recycling scenario Mandatory impact category indicators according to EN 15804

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.36E+03	3.97E-01	1.53E+01	1.18E+01	0.00E+00	-1.09E+03
GWP-fossil	kg CO ₂ eq.	1.36E+03	3.97E-01	1.53E+01	1.17E+01	0.00E+00	-1.09E+03
GWP-biogenic	kg CO ₂ eq.	9.59E-01	4.34E-05	4.47E-04	1.18E-01	0.00E+00	-3.98E+00
GWP-luluc	kg CO ₂ eq.	3.23E-01	3.45E-05	6.23E-03	2.25E-02	0.00E+00	-8.37E-01
ODP	kg CFC 11 eq.	3.26E-05	6.07E-09	2.27E-07	5.06E-08	0.00E+00	6.40E-07
AP	mol H ⁺ eq.	4.01E+00	3.58E-03	3.51E-02	5.98E-02	0.00E+00	-5.99E+00
EP-freshwater	kg P eq.	5.58E-02	1.16E-05	1.21E-03	2.15E-02	0.00E+00	-5.83E-01
EP-marine	kg N eq.	9.82E-01	1.66E-03	8.16E-03	1.66E-02	0.00E+00	-1.47E+00
EP-terrestrial	mol N eq.	1.12E+01	1.82E-02	8.81E-02	1.33E-01	0.00E+00	-1.25E+01
POCP	kg NMVOC eq.	4.30E+00	5.42E-03	4.92E-02	3.70E-02	0.00E+00	-3.89E+00
ADP-minerals&metals*	kg Sb eq.	1.16E-03	1.42E-07	5.01E-05	6.45E-06	0.00E+00	-4.11E-03
ADP-fossil*	MJ	2.33E+04	5.19E+00	2.15E+02	1.22E+02	0.00E+00	-9.66E+03
WDP*	m ³	6.48E+01	1.12E-02	9.81E-01	1.60E+00	0.00E+00	-5.32E+02

* Disclaimer: 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.

Additional mandatory and voluntary impact category indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease inc.	3.40E-05	1.02E-07	1.14E-06	8.96E-07	0.00E+00	-1.48E-04

Human toxicity, cancer ²	CTUh	4.14E-06	1.55E-09	8.06E-08	7.16E-09	0.00E+00	-4.52E-05
Human toxicity, non-cancer ²	CTUh	2.97E-06	6.42E-10	1.35E-07	9.61E-08	0.00E+00	-9.16E-05
Ionising radiation ¹	kBq U-235 eq	1.02E+01	2.33E-03	1.79E-01	2.30E-02	0.00E+00	-6.10E+01
Land use ²	Pt	1.36E+03	3.65E-01	1.30E+02	2.58E+00	0.00E+00	-4.08E+03
Ecotoxicity, freshwater ²	CTUe	3.14E+03	5.72E-01	4.21E+01	3.84E+00	0.00E+00	-2.61E+04

1 – 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.

2 – 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 experience with the indicator.

Additional mandatory and voluntary impact category indicators

Impact category	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG	kg CO ₂ eq	1.36E+03	3.97E-01	1.53E+01	1.18E+01	0.00E+00	-1.09E+03

Resource use indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	2.16E+02	3.09E-02	2.75E+00	9.63E+00	0.00E+00	-1.02E+03
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	2.16E+02	3.09E-02	2.75E+00	9.63E+00	0.00E+00	-1.02E+03
PENRE	MJ	2.33E+04	5.19E+00	2.15E+02	1.22E+02	0.00E+00	-9.66E+03
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.33E+04	5.19E+00	2.15E+02	1.22E+02	0.00E+00	-9.66E+03
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	2.83E+00	3.71E-04	2.97E-02	4.45E-02	0.00E+00	-1.78E+01

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.

Waste indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	Kg	1.78E-01	4.73E-05	5.47E-03	1.28E-02	0.00E+00	-5.40E-01
Non-hazardous waste disposed	Kg	5.74E+01	3.17E-03	1.03E+01	2.43E-01	0.00E+00	-2.19E+02
Radioactive waste disposed	Kg	2.46E-03	5.70E-07	4.38E-05	5.32E-06	0.00E+00	-1.49E-02

Output flow indicators

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	1.00E+03	00E+00	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 LCA results - 100% landfill scenario

Mandatory impact category indicators according to EN 15804

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.36E+03	3.97E-01	1.53E+01	0.00E+00	3.28E-03	0.00E+00
GWP-fossil	kg CO ₂ eq.	1.36E+03	3.97E-01	1.53E+01	0.00E+00	3.27E-03	0.00E+00
GWP-biogenic	kg CO ₂ eq.	9.59E-01	4.34E-05	4.47E-04	0.00E+00	2.81E-07	0.00E+00
GWP-luluc	kg CO ₂ eq.	3.23E-01	3.45E-05	6.23E-03	0.00E+00	1.64E-07	0.00E+00
ODP	kg CFC 11 eq.	3.26E-05	6.07E-09	2.27E-07	0.00E+00	4.75E-11	0.00E+00
AP	mol H ⁺ eq.	4.01E+00	3.58E-03	3.51E-02	0.00E+00	2.96E-05	0.00E+00
EP-freshwater	kg P eq.	5.58E-02	1.16E-05	1.21E-03	0.00E+00	9.48E-09	0.00E+00
EP-marine	kg N eq.	9.82E-01	1.66E-03	8.16E-03	0.00E+00	1.36E-05	0.00E+00
EP-terrestrial	mol N eq.	1.12E+01	1.82E-02	8.81E-02	0.00E+00	1.49E-04	0.00E+00
POCP	kg NMVOC eq.	4.30E+00	5.42E-03	4.92E-02	0.00E+00	4.50E-05	0.00E+00

ADP-minerals&metals*	kg Sb eq.	1.16E-03	1.42E-07	5.01E-05	0.00E+00	1.10E-10	0.00E+00
ADP-fossil*	MJ	2.33E+04	5.19E+00	2.15E+02	0.00E+00	4.20E-02	0.00E+00
WDP*	m ³	6.48E+01	1.12E-02	9.81E-01	0.00E+00	3.58E-05	0.00E+00

* Disclaimer: 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.

Additional mandatory and voluntary impact category indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease inc.	3.40E-05	1.02E-07	1.14E-06	0.00E+00	8.41E-10	0.00E+00
Human toxicity, cancer²	CTUh	4.14E-06	1.55E-09	8.06E-08	0.00E+00	2.17E-13	0.00E+00
Human toxicity, non-cancer²	CTUh	2.97E-06	6.42E-10	1.35E-07	0.00E+00	4.14E-12	0.00E+00
Ionising radiation¹	kBq U-235 eq	1.02E+01	2.33E-03	1.79E-01	0.00E+00	4.05E-06	0.00E+00
Land use²	Pt	1.36E+03	3.65E-01	1.30E+02	0.00E+00	4.12E-02	0.00E+00
Ecotoxicity, freshwater²	CTUe	3.14E+03	5.72E-01	4.21E+01	0.00E+00	1.54E-03	0.00E+00

1 – 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.

2 – 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 experience with the indicator.

Additional mandatory and voluntary impact category indicators

Impact category	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG	kg CO ₂ eq	1.36E+03	3.97E-01	1.53E+01	0.00E+00	3.28E-03	0.00E+00

Resource use indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	2.16E+02	3.09E-02	2.75E+00	0.00E+00	4.50E-02	0.00E+00
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	2.16E+02	3.09E-02	2.75E+00	0.00E+00	4.50E-02	0.00E+00
PENRE	MJ	2.33E+04	5.19E+00	2.15E+02	0.00E+00	7.55E+00	0.00E+00
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.33E+04	5.19E+00	2.15E+02	0.00E+00	7.55E+00	0.00E+00

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	2.83E+00	3.71E-04	2.97E-02	0.00E+00	5.40E-04	0.00E+00

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.

Waste indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.78E-01	4.73E-05	5.47E-03	0.00E+00	6.89E-05	0.00E+00
Non-hazardous waste disposed	kg	5.74E+01	3.17E-03	1.03E+01	0.00E+00	1.00E+03	0.00E+00
Radioactive waste disposed	kg	2.46E-03	5.70E-07	4.38E-05	0.00E+00	8.30E-07	0.00E+00

Output flow indicators

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	0.00E+00	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

Abbreviations

Abbreviation	Definition
General Abbreviations	
EN	European Norm (Standard)
EPD	Environmental Product Declaration
EF	Environmental Footprint
GPI	General Programme Instructions
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
PCR	Product Category Rules
c-PCR	Complementary Product Category Rules
CEN	European Committee for Standardization
CLC	Co-location centre
CPC	Central product classification
GHS	Globally harmonized system of classification and labelling of chemicals
GRI	Global Reporting Initiative
Environmental Impact Indicators (EN 15804)	
GHG	Greenhouse gas
GWP	Global Warming Potential (kg CO ₂ eq.)
GWP-fossil	Global Warming Potential from fossil sources (kg CO ₂ eq.)
GWP-biogenic	Global Warming Potential from biogenic sources (kg CO ₂ eq.)
GWP-luluc	Global Warming Potential from land use and land use change (kg CO ₂ eq.)
GWP-total	Total Global Warming Potential (kg CO ₂ eq.)
GWP-GHG	Global Warming Potential for greenhouse gases (kg CO ₂ eq.)
ODP	Ozone Depletion Potential (kg CFC-11 eq.)
AP	Acidification Potential (mol H ⁺ eq.)
EP	Eutrophication Potential
EP-freshwater	Freshwater eutrophication potential (kg P eq.)
EP-marine	Marine eutrophication potential (kg N eq.)
EP-terrestrial	Terrestrial eutrophication potential (mol N eq.)
POCP	Photochemical Ozone Creation Potential (kg NMVOC eq.)
ADP	Abiotic Depletion Potential
ADP-minerals&metals	Abiotic depletion potential for non-fossil resources (kg Sb eq.)
ADP-fossil	Abiotic depletion potential for fossil resources (MJ)
WDP	Water Deprivation Potential (m ³)
Resource Use Indicators	
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials (MJ)
PERM	Use of renewable primary energy resources used as raw materials (MJ)
PERT	Total use of renewable primary energy resources (MJ)
PENRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)
PENRM	Use of non-renewable primary energy resources used as raw materials (MJ)
PENRT	Total use of non-renewable primary energy resources (MJ)
SM	Use of secondary material (kg)
RSF	Use of renewable secondary fuels (MJ)
NRSF	Use of non-renewable secondary fuels (MJ)
FW	Use of net fresh water (m ³)

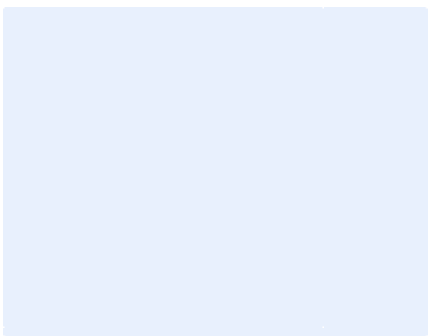
Waste Indicators	
HW	Hazardous Waste (disposed) (kg)
NHW	Non-Hazardous Waste (disposed) (kg)
RW	Radioactive Waste (disposed) (kg)
Output Flow Indicators	
CFR	Components for Reuse (kg)
MR	Material for Recycling (kg)
MER	Materials for Energy Recovery (kg)
EEE	Exported Energy, Electricity (MJ)
EET	Exported Energy, Thermal (MJ)
Lifecycle Stages / Modules	
A1	Raw material supply
A2	Transport
A3	Manufacturing
A4	Transport to site
A5	Construction/Installation
B1	Use
B2	Maintenance
B3	Repair
B4	Replacement
B5	Refurbishment
B6	Operational energy use
B7	Operational water use
C1	Deconstruction/Demolition
C2	Transport to waste processing
C3	Waste processing
C4	Disposal
D	Reuse-Recovery-Recycling potential
Other Relevant Terms	
SVHC	Substances of Very High Concern
EC No.	European Community Number
CAS No.	Chemical Abstracts Service Number
MJ	Megajoule
kg	Kilogram
m³	Cubic Meter
NM VOC	Non-Methane Volatile Organic Compounds
Sb eq.	Antimony Equivalents
P eq.	Phosphorus Equivalents
N eq.	Nitrogen Equivalents
CFC-11 eq.	Chlorofluorocarbon-11 Equivalents
CO₂ eq.	Carbon Dioxide Equivalents
kg C	Kilograms of Carbon
kg CO₂ eq.	Kilograms of Carbon Dioxide Equivalent
ND	Not Declared

References

- General Programme Instructions of the International EPD System. Version GPI 5.0.1.
- PCR 2019:14. Construction Product. Version 2.0.1
- ecoinvent 3.10 database and modelled by using SimaPro software version 10.2.0.1.
- UN statistics division UN CPC code
- EN 15804: EN 15804:2012+A2:2019: Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products.
- EN ISO 14025: EN ISO 14025:2011-10 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- EN ISO 14040: EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles and framework
- EN ISO 14044: EN ISO 14044:2006-10 Environmental management - Life cycle assessment - Requirements and guidelines.
- ISO 50001: 2018, Energy Management
- The selection of data and the data quality requirements have been provided according to the requirements of EN15941

Version History

Original Version of the EPD, 2025-12-26



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