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Semi-finished steel products



Owner of the EPD:

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ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A3 modules in accordance with EN 15804 (Cradle-to-Gate)

The year of preparing the EPD: 2022

Service Life: 100 years

PCR: ITB-PCR A

Declared unit: 1 ton

Reasons for performing LCA: B2B

Representativeness: Polish, European

MANUFACTURER

Liberty Częstochowa Sp. z o.o. is part of the LIBERTY Steel Group, a global steel and mining company with 30,000 employees in more than 200 locations on six continents. Liberty Częstochowa Sp. z o.o. continues 120 years of steel production tradition and currently employs over 1,200 people.

Liberty Częstochowa Sp. z o.o. specializes in the production of structural plates intended for metal structures and composite metal and concrete structures, shipbuilding structural plates and plates for pressure vessels.

PRODUCTS DESCRIPTION AND APPLICATION

The Steelworks of Liberty Częstochowa Sp. z o.o. produces semi-finished products for hot processing. The production range includes: non-alloyed, low-alloyed and alloyed steel slabs and blooms delivered in "as cast" condition. The semi-finished products are made in production routes: Electric Arc Furnace (EAF), secondary metallurgy (LF/VD/VOD), Continuous Casting (CCM).



Fig. 1. Steelworks of Liberty Częstochowa Sp. z o. o.

Table 1. Specification of the semi-finished steel products

| No. | Product | Thickness, mm | Width, mm | Length, mm |
|-----|---------|---------------|-------------|-------------|
| 1 | Slabs | 150, 225 | 1100 ÷ 2000 | 2000 ÷ 9500 |
| 2 | Blooms | 280 | 280 | 2100 ÷ 9800 |

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of the semi-finished steel products is a line process conducted in the steel mill Liberty Częstochowa Sp. z o.o., located in Częstochowa (Poland). All impacts from raw materials extraction and processing are allocated in module A1 of the LCA. Impacts from the global line production of Liberty

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Częstochowa Sp. z o.o. were inventoried allocated to the production of the semi-finished steel products based on the products mass basis. Water and energy consumption, associated emissions and generated wastes are allocated to module A3. Packaging materials were taken into consideration.

System limits

The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A3 in accordance with EN 15804+A2 and ITB PCR A. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Modules A1 and A2: Raw materials supply and transport

Steel scrap, iron pig, bolts, carburizers, bauxite, aluminium, Ca-Si and Ca-Fe wires, copper, ferroalloys, fluxes, ancillary materials and packaging materials come from both local and foreign suppliers. Means of transport include trains and lorries. European standards for average combustion were used for calculations.

Module A3: Production

A scheme of the semi-finished steel products production is presented in Fig. 2.

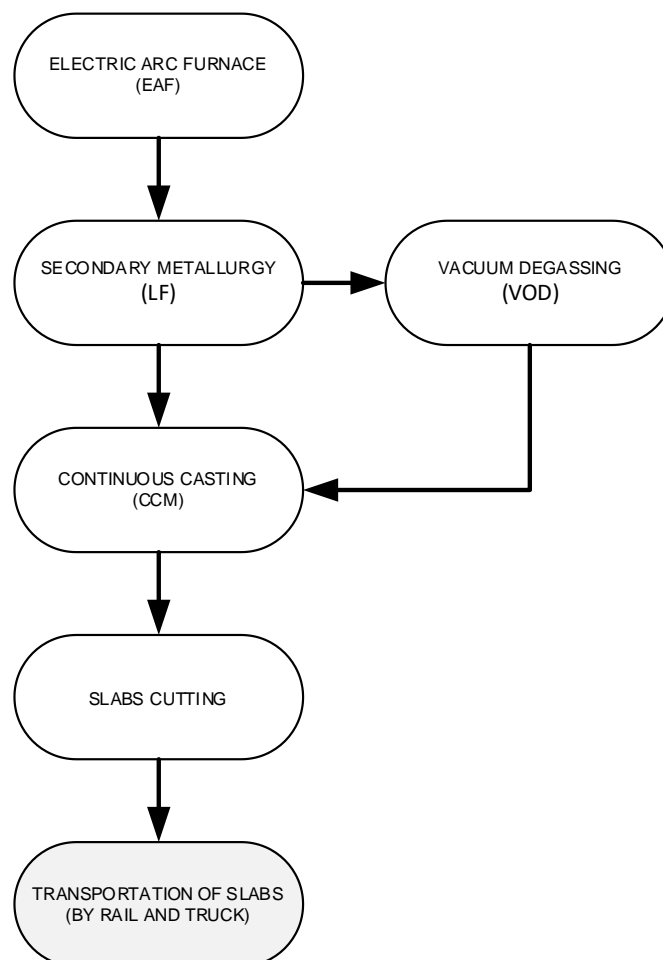


Fig. 2. A scheme of the semi-finished steel products production by Liberty Częstochowa Sp. z o. o.

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End-of-life (EoL): Semi-finished steel products constitute intermediate products, used to produce steel products such as profiles, plates, wires or fibres therefore the impacts occurring at the end-of-life of their life cannot be modeled precisely and thus are not declared within this EPD.

Data quality

The data selected for LCA originate from ITB-LCI questionnaires completed by Liberty Częstochowa Sp. z o.o. using the inventory data, ITB and Ecoinvent v.3.8 databases. No specific data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency are judged as good.

Data collection period

Primary data provided by Liberty Częstochowa Sp. z o.o. covers a period of 01.01.2021 – 31.12.2021 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Assumptions and estimates

The impacts of the representative of the semi-finished products were aggregated using weighted average. Impacts were inventoried and calculated for all products manufactured by Liberty Częstochowa Sp. z o.o.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN15804+A2.

Databases

The data for the processes comes from Ecoinvent v.3.8 and ITB-Database. Specific data quality analysis was a part of an external audit.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 ton of the semi-finished steel products manufactured by Liberty Częstochowa Sp. z o.o.

Table 2. System boundaries for the environmental characteristic of the semi-finished steel products

| Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed) | | | | | | | | | | | | | | | | |
|----------------------------------------------------------------------------------------------------------------------|-----------|---------------|--------------------------------|-----------------------------------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|---------------------------|-----------|------------------|----------|-----------------------------------------------|
| Product stage | | | Construction process | | Use stage | | | | | | | End of life | | | | Benefits and loads beyond the system boundary |
| Raw material supply | Transport | Manufacturing | Transport to construction site | Construction-installation process | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction demolition | Transport | Waste processing | Disposal | Reuse-recovery-recycling potential |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| MD | MD | MD | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND |

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Table 3. Life cycle assessment (LCA) results of the semi-finished products manufactured by Liberty Częstochowa Sp. z o.o. – environmental impacts (DU: 1 ton)

| Indicator | Unit | A1 | A2 | A3 | A1-A3 |
|---------------------------------------------------------------------|--------------------|-----------|----------|----------|----------|
| Global Warming Potential | eq. kg CO2 | 2.18E+02 | 2.08E-02 | 4.00E+02 | 6.19E+02 |
| Greenhouse gas potential - fossil | eq. kg CO2 | 2.19E+02 | 2.08E-02 | 3.94E+02 | 6.12E+02 |
| Greenhouse gas potential - biogenic | eq. kg CO2 | -3.76E-01 | 7.31E-05 | 6.49E+00 | 6.12E+00 |
| Global warming potential - land use and land use change | eq. kg CO2 | 6.28E-02 | 9.38E-06 | 8.59E-02 | 1.49E-01 |
| Stratospheric ozone depletion potential | eq. kg CFC 11 | 8.99E-06 | 4.62E-09 | 1.01E-05 | 1.91E-05 |
| Soil and water acidification potential | eq. mol H+ | 8.05E-01 | 9.33E-05 | 3.60E+00 | 4.40E+00 |
| Eutrophication potential - freshwater | eq. kg P | 9.10E-02 | 1.61E-06 | 6.11E-01 | 7.02E-01 |
| Eutrophication potential - seawater | eq. kg N | 1.93E-01 | 2.94E-05 | 5.14E-01 | 7.07E-01 |
| Eutrophication potential - terrestrial | eq. mol N | 2.04E+00 | 3.21E-04 | 4.42E+00 | 6.47E+00 |
| Potential for photochemical ozone synthesis | eq. kg NMVOC | 1.10E+00 | 9.60E-05 | 1.25E+00 | 2.36E+00 |
| Potential for depletion of abiotic resources - non-fossil resources | eq. kg Sb | 1.73E-04 | 7.49E-08 | 5.10E-04 | 6.83E-04 |
| Abiotic depletion potential - fossil fuels | MJ | 2.29E+03 | 3.04E-01 | 5.98E+03 | 8.27E+03 |
| Water deprivation potential | eq. m ³ | 1.59E+01 | 1.55E-03 | 1.12E+02 | 1.28E+02 |

Table 4. Life cycle assessment (LCA) results of semi-finished products manufactured by Liberty Częstochowa Sp. z o.o – additional impacts indicators (DU: 1 ton)

| Indicator | Unit | A1 | A2 | A3 | A1-A3 |
|------------------------------------------------------------------|-------------------|-----|-----|-----|-------|
| Particulate matter | disease incidence | INA | INA | INA | INA |
| Potential human exposure efficiency relative to U235 | eg. kBq U235 | INA | INA | INA | INA |
| Potential comparative toxic unit for ecosystems | CTUe | INA | INA | INA | INA |
| Potential comparative toxic unit for humans (cancer effects) | CTUh | INA | INA | INA | INA |
| Potential comparative toxic unit for humans (non-cancer effects) | CTUh | INA | INA | INA | INA |
| Potential soil quality index | dimensionless | INA | INA | INA | INA |

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Table 5. Life cycle assessment (LCA) results of **semi-finished products** manufactured by Liberty Częstochowa Sp. z o.o - the resource use (DU: 1 ton)

| Indicator | Unit | A1 | A2 | A3 | A1-A3 |
|----------------------------------------------------------------------------------------------------------------|----------------|----------|----------|----------|----------|
| Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials | MJ | INA | INA | INA | INA |
| Consumption of renewable primary energy resources used as raw materials | MJ | INA | INA | INA | INA |
| Total consumption of renewable primary energy resources | MJ | 1.78E+00 | 5.02E-03 | 3.99E+02 | 4.01E+02 |
| Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials | MJ | INA | INA | INA | INA |
| Consumption of non-renewable primary energy resources used as raw materials | MJ | INA | INA | INA | INA |
| Total consumption of non-renewable primary energy resources | MJ | 2.36E+03 | 3.04E-01 | 6.36E+03 | 8.71E+03 |
| Consumption of secondary materials | kg | 1.01E+03 | 1.23E-04 | 4.81E-01 | 1.01E+03 |
| Consumption of renewable secondary fuels | MJ | 2.53E-03 | 1.15E-06 | 2.51E-03 | 5.05E-03 |
| Consumption of non-renewable secondary fuels | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Net consumption of freshwater resources | m ³ | 3.88E-01 | 4.14E-05 | 7.23E+00 | 7.62E+00 |

Table 6. Life cycle assessment (LCA) results of **semi-finished products** manufactured by Liberty Częstochowa Sp. z o.o. – waste categories (DU: 1 ton)

| Indicator | Unit | A1 | A2 | A3 | A1-A3 |
|----------------------------------|-----------------------|----------|----------|----------|----------|
| Hazardous waste. neutralized | kg | 2.14E+01 | 4.27E-04 | 2.61E-03 | 2.14E+01 |
| Non-hazardous waste. neutralised | kg | 4.36E+02 | 7.13E-03 | 3.85E+01 | 4.74E+02 |
| Radioactive waste | kg | 2.01E+01 | 2.07E-06 | 4.92E-03 | 2.01E+01 |
| Components for re-use | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Materials for recycling | kg | 1.79E-02 | 9.35E-07 | 2.00E+02 | 2.00E+02 |
| Materials for energy recovery | kg | 5.69E-05 | 1.01E-08 | 1.70E-01 | 1.70E-01 |
| Energy exported | MJ per energy carrier | 2.14E+01 | 4.27E-04 | 2.61E-03 | 2.14E+01 |

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Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

| |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The basis for LCA analysis was EN 15804 and ITB PCR A |
| Independent verification corresponding to ISO 14025 (subclause 8.1.3.) <input checked="" type="checkbox"/> external <input type="checkbox"/> internal |
| External verification of EPD: Halina Prejzner, PhD Eng LCA, LCI audit and input data verification: Justyna Tomaszewska, PhD Eng, j.tomaszewska@itb.pl Verification of LCA: Michał Piasecki, PhD, DSc, Eng |

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- ISO 20915:2018 Life cycle inventory calculation methodology for steel products
- KOBiZE Wskaźniki emisyjności CO₂, SO₂, NO_x, CO i pyłu całkowitego dla energii elektrycznej. Grudzień 2021
- World Steel Association 2017 Life Cycle inventory methodology report for steel products

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**CERTIFICATE No 347/2022
of TYPE III ENVIRONMENTAL DECLARATION**

Product:

Semi-finished steel products

Manufacturer:

Liberty Częstochowa Sp. z o.o.

ul. Kucelińska 22, 42-202 Częstochowa, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.

Environmental product declarations.

Core rules for the product category of construction products.

This certificate, issued for the first time on 30th June 2022 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physics, Acoustics
and Environment Department

Agnieszka Winkler-Skalna, PhD



Deputy Director
for Research and Innovation

Krzysztof Kuczyński, PhD

Warsaw, June 2022