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Hot rolled plates



Owner of the EPD:

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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, C2-C4 and D modules in accordance with EN 15804 (Cradle-to-Gate with options)

The year of preparing the EPD: 2022

Product standard: see Tables 1 and 2

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.



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

PRODUCTS DESCRIPTION AND APPLICATION

The Plate Mill of Liberty Częstochowa Sp. z o.o. produces steel plates of structural non-alloyed carbon steels, higher strength low-alloyed steels (HSLA) and high strength steels (HSS), normal and higher strength hull structural steels, for pressure purposes, with specified elevated and low temperature properties, abrasion resistant steels, steels with improved atmospheric corrosion resistance, steels for welded pipes and tubes, special steels – Tabel 1.



Fig. 2. Plate Mill of Liberty Częstochowa Sp. z o. o.

Type III Environmental Product Declaration No. 361/2022

Table 1. The hot rolled plates production range

Plates	Standard
Non-alloy structural steel plates	EN 10025-2
Fine grained structural steel plates	EN 10025-3
Fine grained structural steel plates after thermo mechanical rolling	EN 10025-4
Low alloy weather resistant steel plates	EN 10025-5
High yield strength structural steels in the quenched and tempered condition	EN 10025-6
High Strength Structural Steel Plates (Rm = 630 ÷ 725 Mpa) for pressure vessel structures	ZN-C 03.1
Spring steel heavy plates	TWT 2
Structural quality steel	G40.21
Carbon structural steel	ASTM-A36
Non-alloy structural steel heavy plates	ASTM-A283
Carbon steel pressure plates with low and medium tensile strength	ASTM-A285
HSLA structural steel plates	ASTM-A572
Low-alloy structural steel heavy plates	ASTM-A709
Heat treated alloy steel heavy plates suitable for welding	ASTM-A514
High strength low alloy structural steel	ASTM-A588
Non-alloy steel plates for pressure vessels	EN 10028-2
Alloy steel plates for pressure vessels	EN 10028-2
Fine grained heavy plates for pressure devices	EN 10028-3
Thermomechanically rolled fine grained structural steel plates for pressure vessels	EN 10028-5
Heat treated heavy plates for pressure vessels	EN 10028-6
Molybdenum alloy heavy plates for boilers and pressure vessels	ASTM-A204
Nickel alloy steels with specified low temperature properties	EN 10028-4
High strength carbon steel heavy plates for pressure vessels for moderate and lower temperature service	ASTM-A612
Heat-treated carbon-manganese-silicon steel for pressure vessels	ASTM-A537
Heavy plates for pressure vessels for moderate and lower temperature services	ASTM-A516
Carbon-manganese-silicon steel heavy plates for pressure vessels	ASTM-A662
Chromium-molybdenum alloy steel plates for pressure vessels	ASTM-A387
Heat treated high strength alloy steel plates for pressure vessels	ASTM-A517
Plates for welded large diameter line pipes	API 5L EN 10208-2
Heavy plates for offshore structures	EN 10225
Abrasion resistant heavy plates	ZN-C 02.2
Heat treated non-alloy steel plates	ISO 683-1
Alloy heavy plates operated in elevated temperature	ISO 683-2
Special plates	EN 10084 TWT 1

Type III Environmental Product Declaration No. 361/2022

Steel plates with high yield strength for cold working - thermomechanical rolling	EN 10149-2
Steel plates with high yield strength for cold working - normalisation or normalised rolling	EN 10149-3
Shipbuilding structural plates	Rules of BV, ABS, DNV, LR, RINA, PRS, RMRS

The plates are delivered in following conditions:

- as rolled (AR),
- normalized (N),
- thermo-mechanically rolled (TM),
- quenched and tempered (QT),
- quenched (Q),
- normalized and tempered (NT).

The plates can be delivered as "black/row" or shot blasted & primed.

Table 2. Standard parameters of the hot rolled plates

Maximum weight of a single plate	Up to 10 MT
Thickness	6 ÷ 120 mm
Width	1500 ÷ 3,000 mm
Length	3000 ÷ 12,000 mm
Flatness according to:	EN - 10029
Surface condition:	EN - 10163-2

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 hot rolled plates 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 Częstochowa Sp. z o.o. were inventoried allocated to the production of the hot rolled plates 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, end of life – modules C2-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) 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. To produce the hot rolled plates, Liberty Częstochowa Sp. z o.o. used 94.9% of in-house produced semi-finished steel products containing ca. 95% of recyclate and 5.1% of purchased containing ca. 20% recyclate.

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 and hot rolled plates production is presented in Fig. 3.

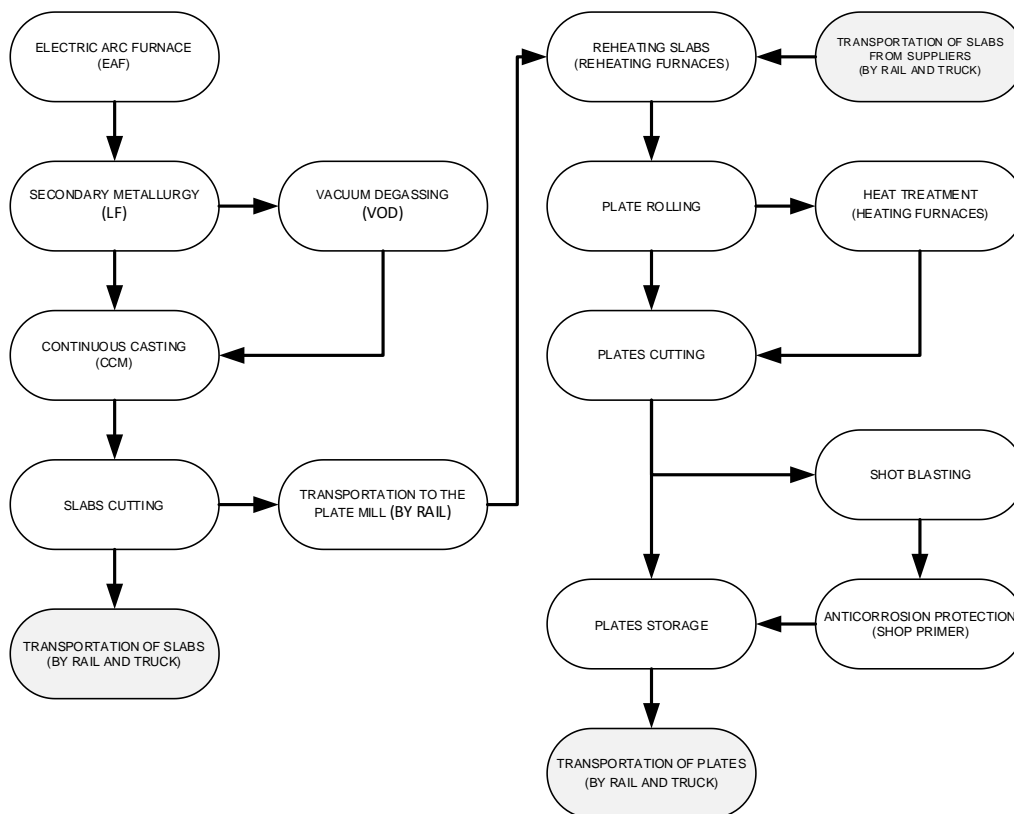


Fig. 3. A scheme of the hot rolled plates production by Liberty Częstochowa Sp. z o.o.

Modules C2-C4 and D: 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.

Hot rolled steel plates are products commonly used to produce prefabricated elements, building objects such as skeleton frames, steel structures, bridges as well as pressure devices, pipe devices, floating units, machines and mining supports. Versatile application on the hot rolled steel plates excludes the possibility of precise modeling of the impacts occurring at the de-construction stage thus the module C1 is not declared. In the adapted end-of-life scenario, the de-constructed steel plates are transported to a steel mill distant by 120 km on > 16t lorry EURO 5 where are used as

Type III Environmental Product Declaration No. 361/2022

steel scrap to produce a new steel. Module D presents credits resulting from the recycling of the steel scrap, calculated in accordance with the approach developed by World Steel Association.

Table 3. End-of-life scenario for the hot rolled steel plates manufactured by Liberty Częstochowa Sp. z o.o.

Material	Material recovery	Recycling	Landfilling
Steel scrap	100%	98%	2%

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 hot rolled plates were aggregated using weighted average. Impacts were inventoried and calculated for all products of the hot rolled plates.

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 hot rolled plates manufactured by Liberty Częstochowa Sp. z o.o.

Table 4. System boundaries for the environmental characteristic of the hot rolled plates.

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	MD	MD	MD	MD

Type III Environmental Product Declaration No. 361/2022

Table 5. Life cycle assessment (LCA) results of **the hot rolled plates** manufactured by Liberty Częstochowa Sp. z o.o. – environmental impacts (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Global Warming Potential	eq. kg CO2	7.90E+02	5.01E-04	3.18E+02	1.11E+03	8.34E-01	1.67E+00	1.06E-01	-1.77E+00
Greenhouse gas potential - fossil	eq. kg CO2	7.82E+02	4.98E-04	3.15E+02	1.10E+03	8.31E-01	1.67E+00	1.05E-01	-1.74E+00
Greenhouse gas potential - biogenic	eq. kg CO2	7.59E+00	2.36E-06	3.28E+00	1.09E+01	2.84E-03	1.43E-03	2.68E-04	-2.48E-02
Global warming potential - land use and land use change	eq. kg CO2	2.17E-01	5.72E-07	5.98E-02	2.77E-01	3.26E-04	1.65E-04	9.94E-05	-5.30E-04
Stratospheric ozone depletion potential	eq. kg CFC 11	2.58E-05	5.85E-11	1.28E-05	3.86E-05	1.92E-07	3.54E-07	4.26E-08	-5.54E-08
Soil and water acidification potential	eq. mol H+	5.30E+00	4.79E-06	2.48E+00	7.78E+00	3.37E-03	8.33E-03	9.90E-04	-1.28E-02
Eutrophication potential - freshwater	eq. kg P	8.26E-01	1.00E-07	4.10E-01	1.24E+00	5.59E-05	5.13E-05	9.81E-06	-2.08E-03
Eutrophication potential - seawater	eq. kg N	8.76E-01	1.83E-06	3.74E-01	1.25E+00	1.02E-03	3.24E-03	3.45E-04	-2.04E-03
Eutrophication potential - terrestrial	eq. mol N	8.16E+00	1.99E-05	3.30E+00	1.15E+01	1.11E-02	3.55E-02	3.77E-03	-1.84E-02
Potential for photochemical ozone synthesis	eq. kg NMVOC	3.06E+00	5.42E-06	1.35E+00	4.41E+00	3.40E-03	1.00E-02	1.10E-03	-6.41E-03
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.30E-03	2.16E-09	3.69E-04	2.67E-03	2.95E-06	8.64E-07	2.42E-07	1.02E-06
Abiotic depletion potential - fossil fuels	MJ	1.02E+04	6.24E-03	5.02E+03	1.52E+04	1.23E+01	2.23E+01	2.89E+00	-2.44E+01
Water deprivation potential	eq. m ³	1.73E+02	7.22E-05	7.16E+01	2.44E+02	5.70E-02	5.97E-02	9.16E-03	-4.00E-01

Table 6. Life cycle assessment (LCA) results of **the hot rolled plates** manufactured by Liberty Częstochowa Sp. z o.o. – additional impacts indicators (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA

Type III Environmental Product Declaration No. 361/2022

Table 7. Life cycle assessment (LCA) results of **the hot rolled plates** manufactured by Liberty Częstochowa Sp. z o.o - the resource use (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	5.58E+02	2.91E-04	2.53E+02	8.11E+02	1.77E-01	1.28E-01	2.51E-02	-1.24E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	1.07E+04	6.24E-03	5.28E+03	1.60E+04	1.23E+01	2.41E+01	2.89E+00	-2.58E+01
Consumption of secondary materials	kg	1.13E+03	8.62E-06	4.00E-01	1.13E+03	4.14E-03	8.72E-03	6.07E-04	-3.30E+00
Consumption of renewable secondary fuels	MJ	1.86E-02	3.15E-08	2.32E-03	2.09E-02	4.56E-05	2.85E-05	1.59E-05	-1.51E-05
Consumption of non-renewable secondary fuels	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
Net consumption of freshwater resources	m ³	9.12E+00	1.73E-06	1.30E+00	1.04E+01	1.55E-03	4.00E-04	3.16E-03	-2.40E-02

Table 8. Life cycle assessment (LCA) results of **the hot rolled plates** manufactured by Liberty Częstochowa Sp. z o.o. - waste categories (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Hazardous waste. neutralized	kg	2.36E+01	3.30E-05	1.12E+01	3.47E+01	1.38E-02	6.22E-05	3.07E-03	6.36E-02
Non-hazardous waste. neutralised	kg	5.70E+02	4.49E-04	2.53E+02	8.23E+02	2.46E-01	3.03E-02	4.32E-02	-9.25E-01
Radioactive waste	kg	2.21E+01	3.57E-08	3.33E-03	2.21E+01	8.50E-05	1.57E-04	1.92E-05	-6.01E-02
Components for re-use	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
Materials for recycling	kg	2.20E+02	1.73E-08	1.36E+02	3.56E+02	3.82E-05	9.80E+02	5.78E-06	-5.97E-01
Materials for energy recovery	kg	1.88E-01	9.17E-10	1.36E-02	2.02E-01	3.09E-07	4.75E-07	6.85E-08	-5.09E-04
Energy exported	MJ per energy carrier	2.09E+01	1.41E-05	9.81E+00	3.07E+01	1.37E-02	9.73E-02	0.00E+00	-6.10E-02

Type III Environmental Product Declaration No. 361/2022

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

Z-ca KIEROWNIKA
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CERTIFICATE No 361/2022
of TYPE III ENVIRONMENTAL DECLARATION

Product:

Hot rolled plates

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.

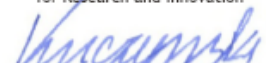
This certificate, issued for the first time on 30th June 2022 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics
and Environment Department


Agnieszka Winkler-Skalna, PhD



Deputy Director
for Research and Innovation


Krzysztof Kuczyński, PhD

Warsaw, June 2022