Environmental Product Declaration

according to ISO 14025 and EN 15804

This declaration is for:

Hot rolled steel plates

Provided by:

Makstil AD

program operator

Stichting MRPI®

publisher

Stichting MRPI®

www.mrpi.nl

MRPI® registration

1.1.00397.2022

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06-12-2027

COMPANY INFORMATION

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PRODUCT

Hot rolled steel plates

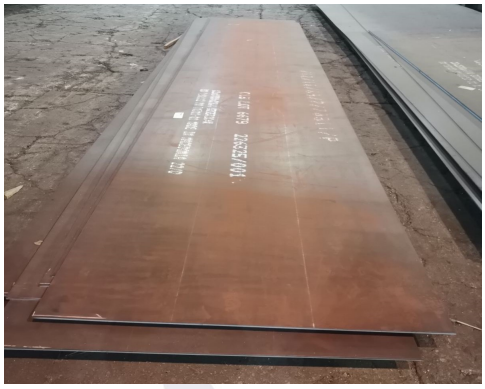
DECLARED UNIT/FUNCTIONAL UNIT

1 kg of hot rolled steel plates with temporary coating

DESCRIPTION OF PRODUCT

Hot rolled thick steel plates, the product of Makstil AD-Skopje, are used as structural steel, steel for shipbuilding, pressure vessels, manufacturing structural parts, pipes, etc.

VISUAL PRODUCT



MRPI® REGISTRATION

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MORE INFORMATION

https://makstil.com/makstil/Products-and-Process/Makstil-Catalog.html

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by **Kamiel Jansen, Aveco de Bondt.**
The LCA study has been done by **Freya Goffart De Roeck, Ecomatters B.V..**
The certificate is based on an LCA-dossier according to ISO14025 and EN15804+A2. It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2. Declaration of SVHC that are listed on the 'Candidate List of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

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ir. J-P den Hollander, Managing director MRPI®

DEMONSTRATION OF VERIFICATION
CEN standard EN15804 serves as the core PCR[a]
Independent verification of the declaration and data, according to EN ISO 14025:2010: internal: external: X
Third party verifier: Kamiel Jansen, Aveco de Bondt
[a] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

Production process

In Makstil's plate mill, 100% recycled steel slab are hot rolled into steel plates. The steel slabs undergo a series of processes, including oxycutting the slabs, heating in a furnace, hot rolling in a quarto mill, hot leveling, stamping, shearing, oxycutting the plates, sand blasting and coating.

Condition of delivery

Hot rolled, sandblasted, temporary coating, flame cut or with sheared edges, surface conditions are black / SB+P

Product raw materials

Steel slab and Carboweld coating

Reference service life: > 50 years

Characteristics for steel plate of Standard EN10025:2	Minimum value	Maximum value	Unit
Thickness	5	45	mm
Width	1.5	3.05	m
Average length	6.0	12.0	m
Average weight	435	10506	kg
Recycled content	100	100	%

Characteristics for steel plate of Standard EN10025:5	Minimum value	Maximum value	Unit
Thickness	6	70	mm
Width	2.05	2.5	m
Average length	6.05	10.65	m
Average weight	2355	8648	kg
Recycled content	100	100	%

COMPONENT >1% of total mass	[%]
Minimal iron content for steel plate of Standard EN10025:2	98.20
Minimal iron content for steel plate of Standard EN10025:5	97.61

SCOPE AND TYPE

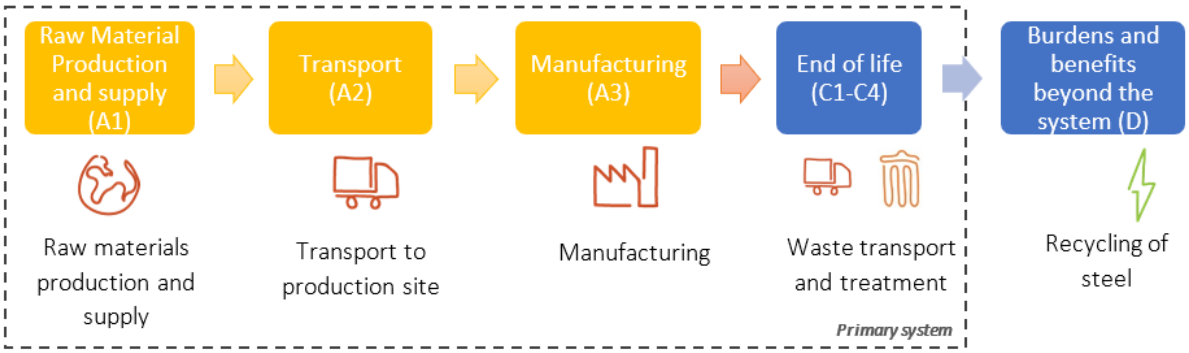
This LCA is Cradle-to-Gate with modules C1-C4 and module D. All major steps from the extraction of natural resources to the final disposal of the product are included in the scope of the study. This EPD is an average EPD for steel plates of standard EN10025:2 and standard EN10025:5. Steel plates of both standards are produced by Makstil in Skopje (North-Macedonia), and the fate of the steel plate product for the end-of-life is described within the North-Macedonian context.

The software GaBi 10.5.1.124 is used to perform the LCA. Background processes are sourced from Ecoinvent 3.8 (2021).

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction 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
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

X = Modules Assessed

ND = Not Declared



LCA process diagram according to EN 15804 (7.2.1)

REPRESENTATIVENESS

The product is the average of ten steel plate variations belonging to two standards:

Standard EN10025:2:

1. S235 JR + N
2. S235 J2 + N
3. S275 JR + N
4. S275 J2 + N
5, S355 JR + N
6. S355 J2 + N
7. S355 K2 + N

Standard EN10025:5:

1. S355 J0W + N
2. S355 J2W + N
3. S355 K2W + N

Steel plates of both Standards are produced at one production site: Makstil Plate mill, Skopje, North-Macedonia

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	UNIT	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	6.89 E-1	2.17 E-3	2.75 E-1	9.67 E-1	3.19 E-3	4.83 E-2	2.07 E-2	0.00	3.85 E-1
GWP-fossil	kg CO2 eq.	6.63 E-1	2.15 E-3	2.77 E-1	9.43 E-1	3.06 E-3	4.80 E-2	2.22 E-2	0.00	3.70 E-1
GWP-biogenic	kg CO2 eq.	2.51 E-2	1.52 E-5	-1.66 E-3	2.35 E-2	1.29 E-4	2.11 E-4	-1.59 E-3	0.00	1.54 E-2
GWP-luluc	kg CO2 eq.	9.23 E-4	3.28 E-6	2.46 E-5	9.51 E-4	3.31 E-6	1.93 E-5	4.29 E-5	0.00	4.24 E-5
ODP	kg CFC11 eq.	4.12 E-8	4.27 E-10	2.48 E-8	6.65 E-8	3.07 E-9	1.11 E-8	2.95 E-9	0.00	1.42 E-8
AP	mol H+ eq.	3.24 E-3	1.72 E-5	8.46 E-4	4.10 E-3	2.87 E-5	1.95 E-4	2.65 E-4	0.00	1.44 E-3
EP-freshwater	kg PO4 eq.	4.06 E-4	2.07 E-7	1.76 E-4	5.82 E-4	1.49 E-6	3.09 E-6	1.41 E-5	0.00	1.46 E-4
EP-marine	kg N eq.	6.77 E-4	7.08 E-6	3.21 E-4	1.00 E-3	3.92 E-6	5.88 E-5	6.00 E-5	0.00	3.61 E-4
EP-terrestrial	mol N eq.	6.89 E-3	7.73 E-5	1.57 E-3	8.54 E-3	3.99 E-5	6.42 E-4	6.72 E-4	0.00	3.55 E-3
POCP	kg NMVOC eq.	1.97 E-3	2.04 E-5	4.50 E-4	2.44 E-3	1.51 E-5	1.97 E-4	1.85 E-4	0.00	1.84 E-3
ADP-minerals & metals	kg Sb eq.	8.26 E-6	5.05 E-9	2.10 E-7	8.48 E-6	6.81 E-9	1.67 E-7	2.64 E-6	0.00	5.50 E-6
ADP-fossil	MJ, net calorific value	1.08 E+1	2.99 E-2	3.77 E+0	1.46 E+1	2.10 E-1	7.29 E-1	3.32 E-1	0.00	4.41 E+0
WDP	m3 world eq. deprived	5.11 E-1	2.12 E-4	-1.62 E-1	3.49 E-1	2.81 E-3	3.48 E-3	7.05 E-3	0.00	-2.94 E-3

GWP-total = Global Warming Potential total
GWP-fossil = Global Warming Potential fossil fuels
GWP-biogenic = Global Warming Potential biogenic
GWP-luluc = Global Warming Potential land use and land use change
ODP = Depletion potential of the stratospheric ozone layer
AP = Acidification Potential, Accumulated Exceedence
EP-freshwater = Eutrophication Potential, fraction of nutrients reaching freshwater end compartment
EP-marine = Eutrophication Potential, fraction of nutrients reaching marine end compartment
EP-terrestrial = Eutrophication Potential, Accumulated Exceedence
POCP = Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals&metals = Abiotic Depletion Potential for non fossil resources [2]
ADP-fossil = Abiotic Depletion for fossil resources potential [2]
WDP = Water (user) deprivation potential, deprivation-weighted water consumption [2]

Disclaimer [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.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	UNIT	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PM	Disease incidence	6.02 E-8	8.39 E-11	3.06 E-9	6.34 E-8	1.35 E-10	3.33 E-9	3.37 E-9	0.00	2.15 E-8
IRP	kBq U235 eq.	1.81 E-1	1.79 E-4	1.08 E-2	1.91 E-1	1.55 E-3	3.73 E-3	3.15 E-3	0.00	-2.23 E-2
ETP-fw	CTUe	1.49 E+1	2.34 E-2	3.62 E+0	1.86 E+1	1.13 E-1	5.86 E-1	1.24 E+0	0.00	1.47 E+1
HTP-c	CTUh	3.22 E-8	1.03 E-12	7.85 E-11	3.22 E-8	1.30 E-12	1.84 E-11	3.82 E-11	0.00	-4.84 E-9
HTP-nc	CTUh	1.89 E-8	1.65 E-11	1.97 E-9	2.09 E-8	3.84 E-11	5.35 E-10	1.67 E-9	0.00	8.67 E-9
SQP	---	3.43 E+0	2.26 E-2	4.95 E-1	3.94 E+0	2.69 E-2	4.98 E-1	5.73 E-1	0.00	-6.10 E-3

PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235 [1]
ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
HTP-c = Potential Comparative Toxic Unit for humans [2]
HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
SQP = Potential soil quality index [2]

Disclaimer [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.

Disclaimer [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.

RESOURCE USE per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PERE	MJ	1.29 E+0	6.64 E-4	6.64 E-4	1.29 E+0	5.48 E-3	1.03 E-2	4.79 E-2	0.00	1.93 E-1
PERM	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	1.29 E+0	6.64 E-4	6.64 E-4	1.29 E+0	5.48 E-3	1.03 E-2	4.79 E-2	0.00	1.93 E-1
PENRE	MJ	1.08 E+1	2.99 E-2	2.99 E-2	1.08 E+1	2.14 E-1	7.29 E-1	3.33 E-1	0.00	4.41 E+0
PENRM	MJ	6.40 E-4	5.27 E-6	5.27 E-6	6.50 E-4	1.07 E-6	3.01 E-5	1.37 E-4	0.00	2.64 E-4
PENRT	MJ	1.08 E+1	2.99 E-2	2.99 E-2	1.08 E+1	2.14 E-1	7.29 E-1	3.33 E-1	0.00	4.41 E+0
SM	kg	1.19 E+0	0.00	0.00	1.19 E+0	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m3	1.19 E-2	4.93 E-6	4.93 E-6	1.19 E-2	7.31 E-5	8.09 E-5	1.64 E-4	0.00	-6.84 E-5

PERE = Use of renewable energy excluding renewable primary energy resources
PERM = Use of renewable energy resources used as raw materials
PERT = Total use of renewable primary energy resources
PENRE = Use of non-renewable primary energy resources excluding non-renewable energy resources used as raw materials
PENRM = Use of non-renewable primary energy resources used as raw materials
PENRT = Total use of non-renewable primary energy resources
SM = Use of secondary materials
RSF = Use of renewable secondary fuels
NRSF = Use of non renewable secondary fuels
FW = Use of net fresh water

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
HWD	kg	0.00	0.00	1.70 E-4	1.70 E-4	0.00	0.00	0.00	0.00	0.00
NHWD	kg	0.00	0.00	1.39 E-1	1.39 E-1	0.00	0.00	0.00	0.00	0.00
RWD	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	1.10 E-1	0.00	0.00
MFR	kg	0.00	0.00	1.37 E-1	1.37 E-1	0.00	0.00	8.90 E-1	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ETE	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

HWD = Hazardous Waste Disposed
NHWD = Non Hazardous Waste Disposed
RWD = Radioactive Waste Disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
BCCpr	kg C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCCpa	kg C	0.00	0.00	9.18 E-4	9.18 E-4	0.00	0.00	0.00	0.00	0.00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging

CALCULATION RULES

Data quality and data collection period:
Data quality requirements follow EN15804+A2:2019, data is checked for plausibility with mass balances in the foreground processes. Used datasets are complete according to the system boundary, and are as current as possible. The data collection period is of reference year 2021, representing 1-year averaged data. For data gaps such as end-of-life scenario's and benefits and loads beyond the system boundary, the default scenario is selected from EN17662. Processes used in the background modelling are referring to Ecoinvent 3.8, the most recent version of the widely used database and are consistent with the foreground modelling in system limits and allocation procedures. The technological and geographical coverage reflects the physical reality as far as possible taking into account the technology mix, location, and representativeness of technologies, input materials, and input energies for the region. Data quality is assessed as very good and adequate to the goal and scope of the study.

Cut-off criteria and allocation procedures:
A cut-off was applied for minor auxiliary components used within the factory, which constitute less than 1% of the total inputs based on mass, and are therefore not expected to contribute significantly. No other cut-offs were intentionally applied to inputs and outputs within the system boundaries in the models. Coproduct and system allocation in the foreground system is according to the EN15804+A2. Cut-off and allocation procedures in the background processes are according to the respective methodologies and estimated to be methodologically consistent with the foreground system.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

The product stage is reported in life cycle stages A1-A3. This life cycle stage includes the extraction and processing of raw materials for the product and the packaging, their transportation to the production site by road, rail and inland waterways, and the manufacturing process. The manufacturing stage (A3) includes all processes related to production, such as hot rolling of steel slabs into steel plates, energy consumption, internal transportation and waste treatment. Data regarding the rolling process was provided for the whole factory site and allocated to each variation of the steel plate product based on physical characteristics.
Electricity consumption was modelled based on primary data on the amount and using the national market mix of the Ecoinvent 3.8 database.
Data on the end-of-life stage (C) are derived from the default scenarios of the standard EN17662 and assumes that no corrosion takes place. Formula D.6. from EN1504+A2 was used to calculate the benefits and loads byond the system boundaries

Life cycle stage	Reuse scenario	Recycle scenario	Unit
Weight of steel plates at end of life	0.11	0.89	kg steel plates

C1: disassembly or demolition	Dismantling	European mix of dismantling/demolition	Unit
Electricity	0.000249	0.000224	MJ
Diesel	0.000456	0.003114	kg
Oxygen	-	0.002011	kg
Propane	-	0.000116	kg

C2: transport	Dismantling	European mix of dismantling/demolition	Unit
Deconstruction site to plant for storage and upgrade to reusable product	200	-	km
Deconstruction site to scrap processing plant	-	100	km
Scrap processing plant to site for end of waste	-	200	km

DECLARATION OF SVHC

None of the substances contained in the product are listed in the “Candidate List of Substances of Very High Concern for authorisation” or they do not exceed the threshold with the European Chemicals Agency.

REFERENCES

EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

prEN 17662 (Draft) Execution of steel structures and aluminium structures – Environmental Product Declarations – Product category rules complementary to EN 15804 for Steel, Iron and Aluminium structural products for use in construction works.

ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework

ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines

Lamlom, Sabah. (2018). A reassessment of carbon content in wood: variation within and between 41 North American species. Biomass and Bioenergy.

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B. (2016). The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, [online] 21(9), pp.1218–1230. Available at: <http://link.springer.com/10.1007/s11367-016-1087-8> [Accessed 14 02 2020].

REMARKS

None