

ENVIRONMENTAL PRODUCT DECLARATION

HOBZERO (ULTRA-LOW CO₂ EMISSIONS) HOT ROLLED COIL / CHECKERED COIL

STRUCTURAL STEEL



TOKYO STEEL
MANUFACTURING CO., LTD.
started out as a small steel maker
in Tokyo almost 80 years ago. It
has since grown into Japan's
leading electric-arc-furnace
steelmaker with an annual
production of several million tons.

Tokyo Steel prides itself as a
recycler of steel scrap - its primary
raw material - letting it protect the
environment and thus contribute to
society. Recycling of steel products
with the electric arc furnace
process is truly the most effective
in terms of achieving a recycling-
based society and low-carbon
society at the same time. To
contribute to Japan's target of
reducing greenhouse gas (GHG)
emissions by 80% by 2050 while
making advanced use of steel
scrap that, in aggregate, amounts
to several decades' worth of
domestic steel demand, Tokyo
Steel will work, with strong
determination, to provide even
more diverse customers with a
wide range of products.



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Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil/Checkered Coil Structural Steel

According to ISO 14025
ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UI Solutions 333 Pfingsten Rd, Northbrook IL, 60062 www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION	UL Solutions Program Operator Rules v2.7 2022
MANUFACTURER NAME AND ADDRESS	Tokyo Steel Manufacturing Co. Ltd. Kasumigaseki Tokyu Bldg. 15F 3-7-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-0013 Japan
DECLARATION NUMBER	4792045923.101.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil/Checkered Coil Structural Steel, 1 metric ton
REFERENCE PCR AND VERSION NUMBER	ISO 21930:2017 serves as the core PCR SMART EPD® Part A Product Category Rules for Building and Construction Products and Services Standard 1000, version 1.2, March 14, 2025 SMART EPD® Part B Product Category Rules for Designated Steel Construction Products, Standard 1000-008, version 3, April 3, 202526, 2020
DESCRIPTION OF PRODUCT APPLICATION/USE	Structural steel "Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil/Checkered Coil" is mostly used in buildings and civil works, mainly in structural steel constructions. In addition to the construction sector there are numerous applications in very diverse sectors.
PRODUCT RSL DESCRIPTION (IF APPL.)	The Reference service life is not specified
MARKETS OF APPLICABILITY	Japan
DATE OF ISSUE	December 22 nd , 2025
PERIOD OF VALIDITY	5 Years
EPD TYPE	Facility specific
EPD SCOPE	Cradle to gate
YEAR(S) OF REPORTED PRIMARY DATA	April 2024 and March 2025
LCA SOFTWARE & VERSION NUMBER	Microsoft Excel calculation tool with Ecoinvent database
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent v3.10 (EN15804 system) database (2023), ecoinvent
LCIA METHODOLOGY & VERSION NUMBER	TRACI

Independent verification of the declaration and data, according to EN ISO 14025:2010 (ISO 14025:2006)

This declaration was independently verified in accordance with ISO 14025: 2006.

INTERNAL EXTERNAL

Third Party Verifier

Cooper McCollum, UL Solutions

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: comparison of the environmental performance of construction works and construction products using EPD information shall be based on the product's use and impacts at the construction works level. In general, EPDs may not be used for comparability purposes when not considered in a construction works context.

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Structural Steel

According to ISO 14025/ISO 21930:2017

Product information

Product description

The product declared is structural steel “Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil / Checkered Coil”, which is classified as “Floor plates” in the Section 2, Classification of Material of the AISC 303 - 10 Code of Standard Practice for Steel Buildings and Bridges. The production process used is the Electric Arc Furnace. This route, used by TOKYO STEEL to produce structural steel, is based on the direct melting of scrap with an Electric Arc Furnace, which is subsequently processed in rolling mills to obtain the finished products. The steel section is hot rolled into structural steel sheet in coil. No metallic or organic coating.

The product is provided for Japan market and other export markets. The products comply with JIS G 3101, JIS G 3106, JIS G 3136, JIS G 3113, JIS G 3125, JIS G 3132, JIS G 3131 (Regional designation code: JIS).

Application

Structural steel “Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil/Checkered Coil” is mostly used in buildings and civil works, mainly in structural steel constructions. In addition to the construction sector there are numerous applications in very diverse sectors.

No specific product is needed to serve intended function in the construction work. Anticipated replacement cycle of product in the construction work will be about 20 years.

Technical data

Name	Value	Unit
Density	7,874	kg/m ³
Modulus of elasticity	2.1×10 ⁵	N/mm ²
Coefficient of thermal expansion	11.7	10 ⁻⁶ K ⁻¹
Thermal conductivity	48	W/(mK)
Melting point	1,516	°C
Electrical conductivity at 20C	1.0×10 ⁷	Ω ⁻¹ m ⁻¹
Minimum yield strength	215	N/mm ²
Minimum tensile strength	315	N/mm ²
Minimum elongation	16	%
Tensile strength	436	N/mm ²
Compressive strength	235	N/mm ²
Grade of material according to the delivery standards	SS400	-



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Delivery status

The delivery conditions and dimension may vary according to the intended application.

Base materials / Ancillary materials

Structural steel "Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil / Checkered Coil" is a low-alloy steel product. The typical content of carbon is lower than 0.18%. The share of other elements besides iron is typically around 1%. Steel scrap is a secondary raw material, defined in different qualities, depending on the composition (Fe content) and certain characteristics (plate, section steel, galvanized sheets, etc.).

The principal material is steel and alloying elements are added on the form of ferroalloys and metals.

Any hazardous substances defined in Basel Convention and/or regulated by Japanese laws are not included in raw materials.

Manufacture

The steel scrap is melted in an electric arc furnace to obtain liquid steel, which is then refined in a ladle furnace with addition of ferroalloys and metals to obtain the required steel characteristics. The steel is then casted at a continuous caster to obtain semi-finished products. The semis are then rolled to the desired size.

TOKYO STEEL MFG produces the structural steel "Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil / Checkered Coil" at one factory (Tahara factory).

Factory	Address
TOKYO STEEL MFG Tahara Plant	2-1-3, Shirahama, Tahara-shi, Aichi 441-3436, Japan



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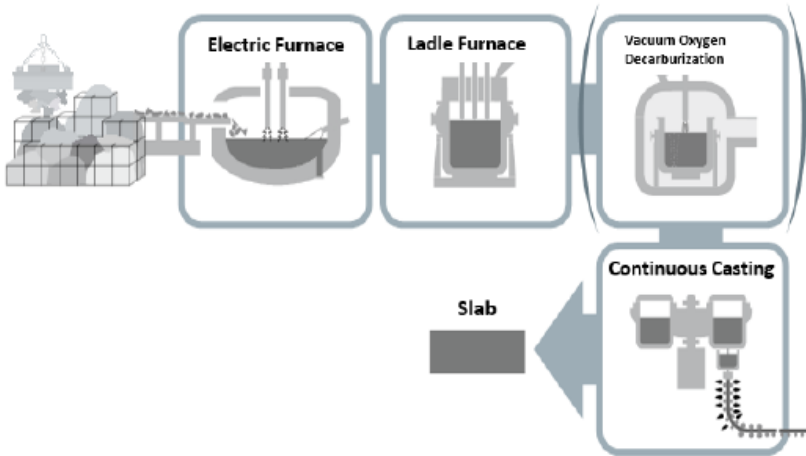


Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil/Checkered Coil Structural Steel

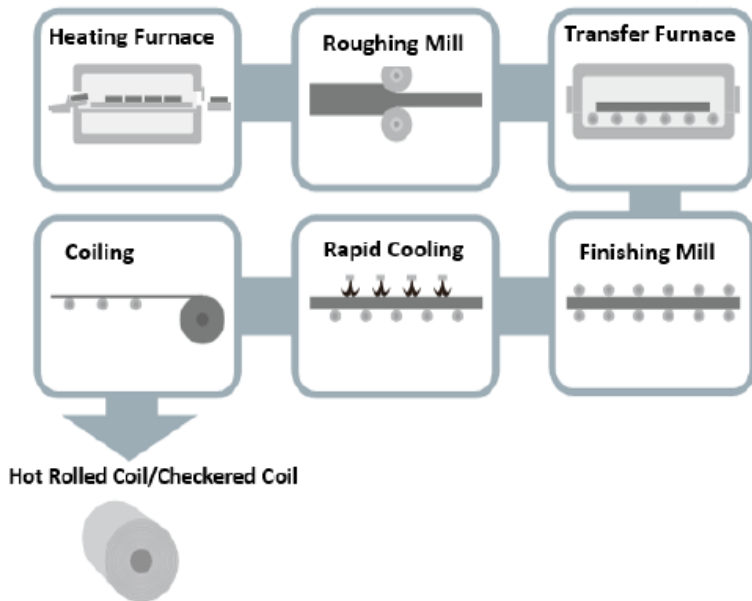
According to ISO 14025/ISO 21930:2017

Manufacturing process flow

Steelmaking Process



Rolling Process



Quality Management System

TOKYO STEEL MFG Tahara Plant is certified according to ISO9001 Quality Management System.

More information can be found at

Environment



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<https://www.tokyosteel.co.jp/company/about/>

Environment Management System

TOKYO STEEL MFG Tahara Plant is certified according to ISO14001 Environment Management System.

More information can be found at

<https://www.tokyosteel.co.jp/company/about/>

Product processing/Installation

Processing and proper use of steel products depend on the application and should be made in accordance with generally accepted practices, standards, and manufacturers recommendations. National technical regulations apply to the design and construction of steel structures. They deal with requirements for performance, sustainability, durability and fire resistance of steel and steel structures.

When handling and using the products, no additional means to protect health are required beyond the usual occupational safety measures.

No environmental impacts occur when working with or using these products under normal conditions of use. No special measures are necessary for the protection of the environment.

Residual materials are separated for in-house recycling. The steel scrap can be recycled almost completely.

Packaging

Structural steel "Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil / Checkered Coil" is secured with strapping bands.

Condition of use

During use no changes in material composition shall occur. Maintenance requirement will depend on specific design and application.

Environment and health during use

Steel products, under normal conditions of use, do not cause adverse health effects.

If the steel products are used according to their intended use, under normal conditions, there will be no significant environmental impact to water, air/atmosphere and soil.

Reference service life

The Reference service life is not specified. This LCA study covers only Module A1 to A3 and there are many different



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applications.

Extraordinary effect

Fire: Structural steels are classified as incombustible materials according to Notification No. 1400 by Ministry of Construction Japan

Water: Not relevant

Mechanical destruction: Not relevant

Reuse and recycle

The product "Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil / Checkered Coil" can be reused after its recovery, in particular when steel constructions are properly designed to facilitate disassembly and re-use at the end of their useful lives.

Steel is 100% recyclable and scrap can be converted to the same (or higher or lower) quality of steel depending upon the metallurgy and processing of the recycling route.

Disposal

Due to its high value as a resource, steel scrap is not disposed of, but instead in a well-established cycle fed to reuse or recycling. Disposal is not included in the study.

The disposal pathway in Japan: Recycling (99%), Landfill (1%), Incineration (0%)

Waste code according to Basel convention is

A1010: Metal wastes

And Waste classification according to Japanese national law "Waste Management Law" is

Industrial Waste: 1210 Steel scrap

Industrial Waste shall be collected by a licensed collector.

Further information

Additional information can be obtained from <http://www.tokyosteel.co.jp/>



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LCA Rules

Declared unit

Name	Value	Unit
Declared unit	1	metric ton
Density	7,874	kg/m ³
Conversion factor to 1kg	0.001	-
Thickness	1.45 - 25.0	mm

System boundary

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the 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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

This is an EPD based on a cradle-to-gate life cycle assessment. The selected system boundaries of this study encompass the following steps:

- A1: Production of raw materials and energy
- A2: Transport of resources to the production site
- A3: Production of the product

Principally the inventory data include material, energy, auxiliary, water consumption (foreground data). The foreground data are derived from the Tahara Plant.

Further, LCA data sets (background data) linked to the foreground data of various stages of the life cycle (cradle to gate) were obtained Ecoinvent v3.10 (EN15804 system) database (2023).



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No known flows are deliberately excluded from this EPD except for strapping bands which were demonstrated to be below the cut-off threshold.

Capital goods and infrastructure flows are excluded from the product system boundary.

Estimates and Assumptions

Regarding the transportation of raw materials, it is assumed:

- The distances of the transportation for 21% of Coal cokes were unknown. It was assumed that the distance of land transportation was 587.2km with truck and the distance of marine transportation was 450.0 km with ferry respectively.
- Internal circulation steel scraps were transported inside the plant from where they were produced to the Ultra-low CO2 missions Hot Rolled Coil / Checkered Coil production zone, and the distance of the transportation is assumed 2.9km.

The emission factor for electricity used in the production of "Hobozero (Ultra-low CO2 emissions) Ultra-low CO2 missions Hot-Rolled Coil / Checkered Coil" is assumed to be location-based, representing the "average technology mix in Japan". And additionally, market-based data from Ecoinvent "electricity, high-voltage, renewable energy product market" is also considered for the market-based approach.

Slag is produced as by-products in the production stage (A3 module). It is eventually recycled mainly for base layer of roads. It is considered as reminderflow in this study and the transportation for the recycling for slag is not considered in this study.

Cut-off rules

The cut-off criteria are 1 % of renewable primary resource (energy), 1 % nonrenewable primary resource (energy) usage, 1 % of the total mass input of that unit process and 1 % of environmental impacts. The total of neglected input flows per module are a maximum of 5 % of energy usage, mass and environmental impacts. These cut-off criteria align with ISO 21930.

In the calculation of the A1 module, strapping bands were excluded after confirming the impact was small. They were 0.0309% of the total resources on a weight basis as input flows for the A1 module calculation.

The transportation of primary raw materials (Steel scrap, Coal coke, Calcium oxide, Ferro-manganese, and Internal circulation steel scrap) to the production site were included as input flows in the calculation of the A2 module. On the other hand, the transportation of the other raw materials were excluded as input flows in the calculation of the A2 module due to the lack of data availability, after confirming their impacts were small. The total excluded resources were 0.519% of the total resources on a weight basis as input flows for the A2 module calculation.

These cut-offs are confirmed meeting the cut-off criteria mentioned above.

Except the above cut-offs, all information from the data collection process has been considered, covering all used and registered materials, thermal energy, electrical energy, and diesel consumption.

Data quality

Principally the inventory data include material, energy, auxiliary, water consumption (foreground data). The foreground

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data are derived from Tahara Plant.

Further, LCA data sets (background data) linked to the foreground data of various stages of the life cycle (cradle to gate) were obtained from Ecoinvent v3.10 (EN15804 system) database (2023).

Time coverage: Primary data was collected at Tahara Plant between April 2024 and March 2025. Secondary data comes from Ecoinvent v3.10 (EN15804 system) database (2023). The data referenced year varies.

Geographical coverage: This product is produced and provided in Japan. Primary data was collected in Japan and secondary data was referred by Ecoinvent database.

Technology coverage: State-of-the-art at the time when the data was developed.

Allocation

The manufacturing process generates by-products, slag, and internal circulation steel scrap. All environmental impacts are allocated to the steel product (i.e., they are not allocated to any of by-products and slag). All internal circulation steel scrap outputs are input to this main product.

Most of energy such as Electricity, Gas was measured at individual meter at each line. This represents the total energy consumption for manufacturing all hot rolled coils, including products that are not Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil / Checkered Coil.

Therefore, the energy consumption per ton of hot rolled coil (including products that are not Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil / Checkered Coil) was calculated by dividing the amount of energy used to manufacture all hot rolled coils by the manufacturing weight of all hot rolled coils.

Since industrial water volume was measured at a factory level, the industrial water volume was allocated based on the product manufacturing mass volume.

The hot-rolled coils manufactured at Tahara plant were classified into the following two product types:

- "Hobozero (Ultra-low CO2 emissions) Hot-Rolled Coil / Checkered Coil" (produced for Japanese market in September 2024)
- Conventional Hot-Rolled Coil / Checkered Coil

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to ISO 21930 and the building context, respectively the product-specific characteristics of performance, are taken into account.



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Life Cycle Assessment Results – [Location Base]

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Tokyo Steel shows two results based on Location-base approach and Market-base approach.

The location-based greenhouse gas emissions from electricity used in manufacturing were calculated using the general emission factor of 0.6595 kg-CO₂eq/kWh for a general emission factor for electricity (high voltage, production mix) in Japan provided by the Ecoinvent database, resulting in 21,452 kg-CO₂eq.

Environment Impact					
Impact Category	Units	Total	A1	A2	A3
Global warming (GWP)	kg-CO ₂ eq	7.99E+02	2.42E+02	7.38E+00	5.49E+02
Acidification (AP)	kg-SO ₂ eq	3.89E+00	1.42E+00	6.86E-02	2.40E+00
Eutrophication (EP)	Kg-N-eq	2.43E+00	1.33E+00	8.54E-03	1.09E+00
Ozone depletion (ODP)	kg-CFC-11eq	9.90E-06	1.48E-06	1.14E-07	8.30E-06
Photo Chemical Ozone Creation (POCP)	kg-O ₃ eq	4.88E+01	1.93E+01	1.45E+00	2.81E+01

Since this LCA study is based on the previous LCA study for the same hot coil product, which was conducted with the UL PCRs “Product Category Rules for Building-Related Products and Services (in Brazil, Japan, China, Korea, Europe, North America, India, South East Asia) Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL Environment, Standard 10010, Version 4.0, March 28, 2022” and “Product Category Rule (PCR) Guidance for Building-Related Products and Services Part B: Designated Steel Construction Product LCA Requirements, UL 10010-34, Second Edition, August 26, 2020” and that LCA not have the data for GWP-fossil, GWP-biogenic, GPW-luluc, this LCA shows only the total GWP data.

Comparability: Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.

Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Carbon dioxide emissions and removals from biogenic sources, carbonation, and combustion of waste are not relevant to this product system and were not included in the calculation of GWP.



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Resource Use					
Parameter	Units	Total	A1	A2	A3
Renewable primary resources used as energy carrier	MJ	8.83E+02	2.68E+02	1.26E+00	6.14E+02
Renewable primary resources with energy content used as material	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as an energy carrier	MJ	9.15E+03	2.43E+03	1.02E+02	6.61E+03
Non-renewable primary resources with energy content used as material	MJ	2.22E+01	2.22E+01	0.00E+00	0.00E+00
Secondary materials	kg	1.53E+00	7.45E-01	4.81E-02	7.35E-01
Renewable secondary fuels	MJ	2.91E-02	2.57E-02	4.66E-04	2.99E-03
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	1.36E+00	9.43E-01	1.74E-02	3.98E-01
Use of net fresh water resources	m ³	3.08E+00	2.07E+00	1.24E-02	1.00E+00
Abiotic depletion potential for fossil resources	MJ	9.15E+03	2.43E+03	1.02E+02	6.61E+03

Output Flows and Waste Categories					
Parameter	Units	Total	A1	A2	A3
Hazardous waste disposed	kg	1.25E+02	5.87E+01	1.74E-01	6.60E+01
Nonhazardous waste disposed	kg	1.68E+03	6.79E+02	3.07E+00	1.00E+03
High-level radioactive waste, conditioned, to final repository	kg	2.11E-03	7.14E-04	5.79E-06	1.39E-03
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	7.52E-03	1.52E-03	1.38E-05	5.99E-03
Components for reuse	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Materials for recycling	kg	7.57E+01	0.00E+00	0.00E+00	7.57E+01
Materials for energy recovery	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Recovered energy exported from the product system	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Carbon Emissions					
Parameter	Units	Total	A1	A2	A3
Calcination Carbon Emissions	kg-CO ₂	2.14E+01	2.14E+01	-	-



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Additional life Cycle Assessment Results – [Market Base]

The market-based greenhouse gas emissions from electricity used in manufacturing were calculated using the general emission factor of 0.0099 kg-CO₂eq/kWh for a general emission factor for electricity (high-voltage, renewable energy product market) provided by the Ecoinvent database, resulting in 321 kg-CO₂eq.

At Tahara Plant, 32,527 kWh of electricity was used for the production of “Hobozero (Ultra-low CO₂ emissions) Hot Rolled Coil / Checkered Coil” for Japanese market in September 2024. To cover this amount, 592,297 kWh was procured from a renewable energy menu offered by a retail electricity provider, and a renewable energy non-fossil certificate derived from the various solar power plants was granted.

As for the non-fossil certificate, the combined total of 37,066 kWh from #GB374A2310021 (19,038 kWh) and #GM844A2310021 (18,028 kWh) was used as the electricity consumed in the production of “Hobozero (Ultra-low CO₂ emissions) Hot Rolled Coil / Checkered Coil”.

Environment Impact					
Impact Category	Units	Total	A1	A2	A3
Global warming (GWP)	kg-CO ₂ eq	3.56E+02	2.42E+02	7.38E+00	1.06E+02
Acidification (AP)	kg-SO ₂ eq	2.12E+00	1.42E+00	6.86E-02	6.33E-01
Eutrophication (EP)	Kg-N-eq	1.69E+00	1.33E+00	8.54E-03	3.55E-01
Ozone depletion (ODP)	kg-CFC-11eq	1.87E-06	1.48E-06	1.14E-07	2.76E-07
Photo Chemical Ozone Creation (POCP)	kg-O ₃ eq	2.65E+01	1.93E+01	1.45E+00	5.78E+00

Since this LCA study is based on the previous LCA study for the same hot coil product, which was conducted with the UL PCRs “Product Category Rules for Building-Related Products and Services (in Brazil, Japan, China, Korea, Europe, North America, India, South East Asia) Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL Environment, Standard 10010, Version 4.0, March 28, 2022” and “Product Category Rule (PCR) Guidance for Building-Related Products and Services Part B: Designated Steel Construction Product LCA Requirements, UL 10010-34, Second Edition, August 26, 2020” and that LCA not have the data for GWP-fossil, GWP-biogenic, GPW-luluc, this LCA shows only the total GWP data.

Resource Use					
Parameter	Units	Total	A1	A2	A3
Renewable primary resources used as energy carrier	MJ	2.95E+03	2.68E+02	1.26E+00	2.68E+03
Renewable primary resources with energy content used as material	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as an energy carrier	MJ	3.36E+03	2.43E+03	1.02E+02	8.25E+02
Non-renewable primary resources with energy content used as material	MJ	2.22E+01	2.22E+01	0.00E+00	0.00E+00



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Secondary materials	kg	1.11E+00	7.45E-01	4.81E-02	3.17E-01
Renewable secondary fuels	MJ	2.73E-02	2.57E-02	4.66E-04	1.13E-03
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	1.19E+00	9.43E-01	1.74E-02	2.28E-01
Use of net fresh water resources	m ³	1.17E+01	2.07E+00	1.24E-02	9.57E+00
Abiotic depletion potential for fossil resources	MJ	3.36E+03	2.43E+03	1.02E+02	8.25E+02

Output Flows and Waste Categories					
Parameter	Units	Total	A1	A2	A3
Hazardous waste disposed	kg	1.01E+02	5.87E+01	1.74E-01	4.22E+01
Nonhazardous waste disposed	kg	1.24E+03	6.79E+02	3.07E+00	5.58E+02
High-level radioactive waste, conditioned, to final repository	kg	7.77E-04	7.14E-04	5.79E-06	5.68E-05
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	1.69E-03	1.52E-03	1.38E-05	1.50E-04
Components for reuse	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Materials for recycling	kg	7.57E+01	0.00E+00	0.00E+00	7.57E+01
Materials for energy recovery	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Recovered energy exported from the product system	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00



ENVIRONMENTAL PRODUCT DECLARATION



Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil/Checkered Coil
Structural Steel

According to ISO 14025/ISO 21930:2017

Interpretation

Completeness

As mentioned before, strapping bands were excluded for the A1 module calculation in the section Cut-off rule. The total excluded resources were 0.0309% of the total included resources on a weight basis as input flows for the A1 module calculation.

The estimated impacts of the exclusion on core environmental impact indicators are lower than 0.02% of any of them.

Environment Impact					
Impact Category	Units	A1-A3	A1	A1 impact of total	A1 impact
GWP	kg-CO ₂ eq	7.99E+02	2.42E+02	30.33%	0.009%
AP	kg-SO ₂ eq	3.89E+00	1.42E+00	36.54%	0.011%
EP	kgPO ₄ ³⁻ eq	2.43E+00	1.33E+00	54.66%	0.017%
ODP	kg-CFC-11eq	9.90E-06	1.48E-06	14.98%	0.005%
POCP	kg-C ₂ H ₄ eq	4.88E+01	1.93E+01	39.56%	0.012%

Environment Impact					
Parameter	Units	A1-A3	A1	A1 impact of total	A1 impact
RPRE	MJ	8.83E+02	8.27E+00	0.94%	0.000%
NRPRE	MJ	9.15E+03	2.43E+03	26.58%	0.008%

The transportation of non-primary resources for the production were excluded from input flows for the A2 module calculation as explained in the section Cut-off criteria. The total excluded resources were 0.519% of the total included resources on a weight basis as input flows for the A2 module calculation.

The estimated impacts of the exclusion on core environmental impact indicators are lower than 0.02% of any of them.

Environment Impact					
Impact Category	Units	A1-A3	A2	A2 impact of total	A2 impact
GWP	kg-CO ₂ eq	7.99E+02	7.38E+00	0.92%	0.005%
AP	kg-SO ₂ eq	3.89E+00	6.86E-02	1.76%	0.009%
EP	kgPO ₄ ³⁻ eq	2.43E+00	8.54E-03	0.35%	0.002%



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Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil/Checkered Coil
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ODP	kg-CFC-11eq	9.90E-06	1.14E-07	1.15%	0.006%
POCP	kg-C ₂ H ₄ eq	4.88E+01	1.45E+00	2.97%	0.015%

Environment Impact					
Parameter	Units	A1-A3	A2	A2 impact of total	A2 impact
RPRE	MJ	8.83E+02	1.26E+00	0.14%	0.001%
NRPRE	MJ	9.15E+03	1.02E+02	1.12%	0.006%

Sensitivity

Precise emission factors for some of raw materials in A1 module do not exist in Ecoinvent v3.10 (EN15804 system) database. Therefore, proxies of emission factors in the database were used for this study. The proxies used are shown in the below Table.

Module	Name of Material	Proxy data	
		Data code	Activity name
A1	Calcium Aluminate	4336307b-03dd-566e-9367-fb5b740460d9_9c78fb2b-13ba-46ab-8e5c-7996d9526938	aluminum alloy production, metallic matrix composite
	Calcium silicon	ce651fec-5166-5ae8-998f-5da29a5507bd_1e87e7db-557d-490d-b0bf-946d78833e56	ferrosilicon production
	Ferro-boron	ce651fec-5166-5ae8-998f-5da29a5507bd_1e87e7db-557d-490d-b0bf-946d78833e56	ferrosilicon production
	Industry water	76e63b8d-541f-59bc-8510-7842d74f774b_c5adb1fb-872e-4446-a3bb-c4b61aa4bd45	tap water production, conventional treatment

The estimated impact of the use proxies on core environmental impacts indicators are shown in the below table. It is calculated based on the assumptions that the core environmental impacts derived from the raw materials using the proxies could be 10% higher than the results in this study if they could use precise emission factors instead.

Environment Impact				
Impact Category	Units	A1-A3	Impact of proxies	10% of proxies impact



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GWP	kg-CO ₂ eq	7.99E+02	0.66%	0.066%
AP	kg-SO ₂ eq	3.89E+00	0.63%	0.063%
EP	kgPO ₄ ³⁻ eq	2.43E+00	1.13%	0.113%
ODP	kg-CFC-11eq	9.90E-06	0.51%	0.051%
POCP	kg-C ₂ H ₄ eq	4.88E+01	0.61%	0.061%

Consistency

All foreground data was gathered with the same level of detail and all background data (emission factors) were sourced from Ecoinvent v3.10 (EN15804 system) database, selecting the most appropriate geographical characteristics of the data available.

Representativeness

Tahara Plant produces Structural steel “Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil / Checkered Coil”. All foreground data used was gathered from Tahara Plant.

Limitation

The products are expected to be sold to processing companies and to be used in the buildings in Japan eventually. However, it might not be necessarily true in some cases. In that case, the LCA results might be different. These are considered as limitations.

Conclusion

A3 module accounts for the largest impact at the GWP-total indicator. Tokyo steel uses the Electric Arc Furnace production process to utilize steel scrap as secondary material. This process can save raw materials to input, but it needs electricity in the production process.

“Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil / Checkered Coil” may reduce GWP with using renewable electricity at the manufacturing process.

As a result, the GWP per ton of product for the A3 module was 549 kgCO₂-eq on a location base and 106 kgCO₂-eq on a market base.



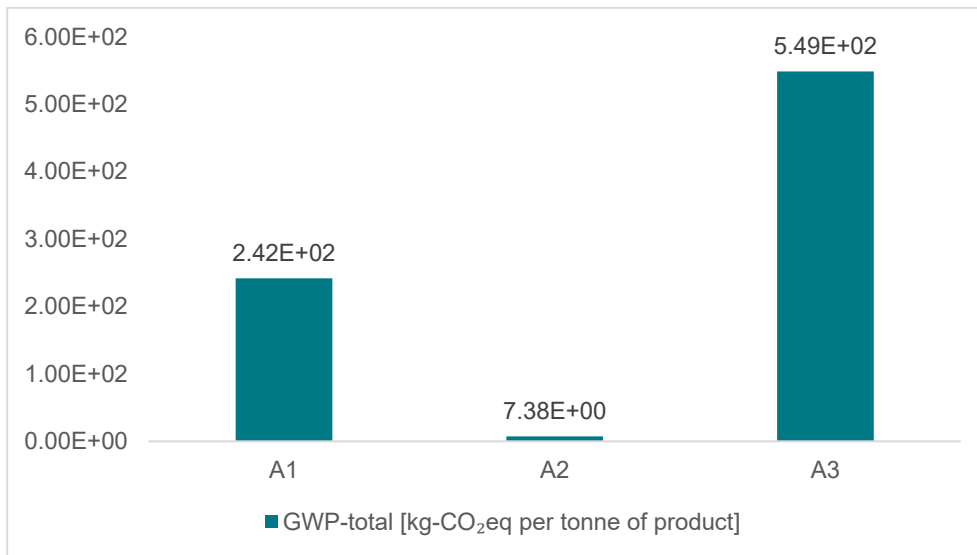
ENVIRONMENTAL PRODUCT DECLARATION



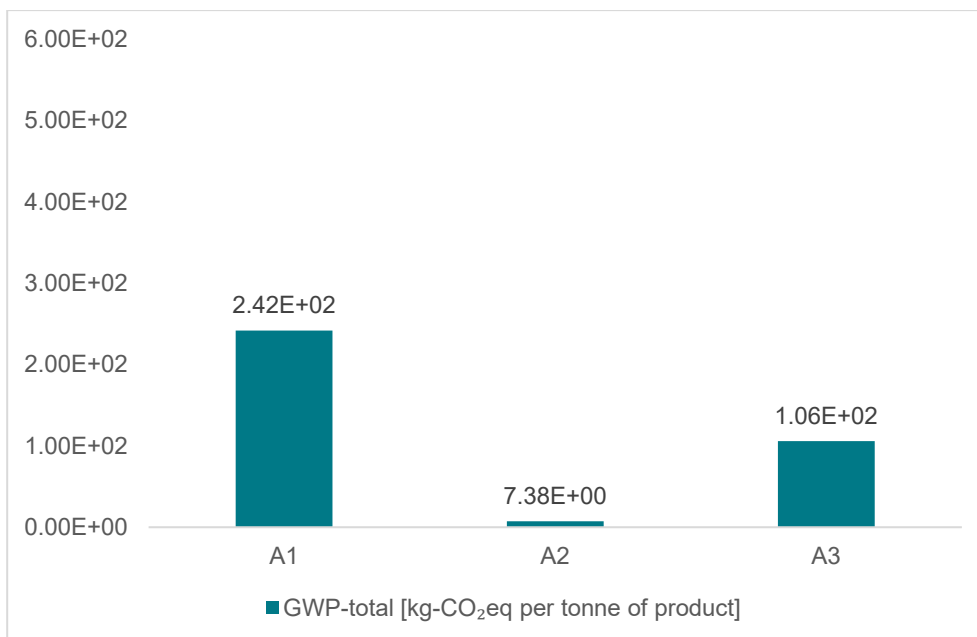
Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil/Checkered Coil
Structural Steel

According to ISO 14025/ISO 21930:2017

Location base approach



Market base approach



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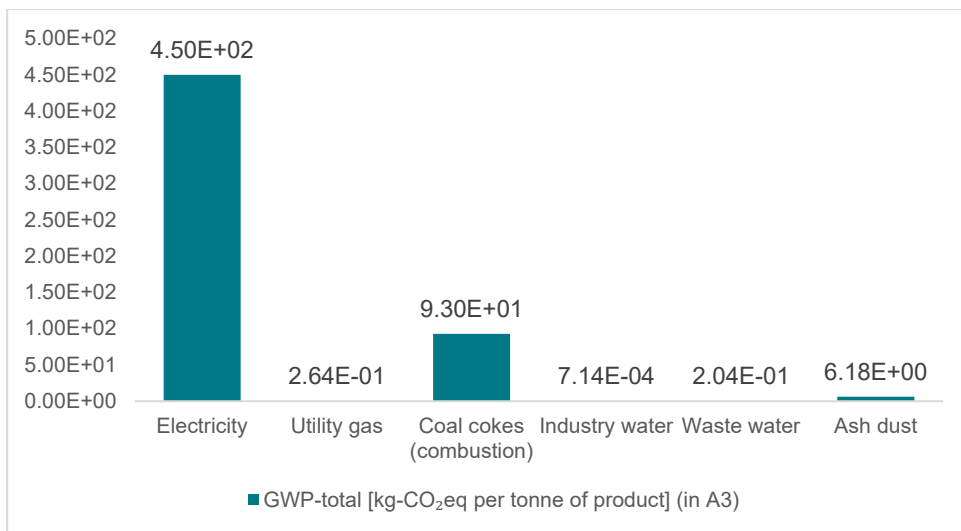
Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil/Checkered Coil
Structural Steel

According to ISO 14025/ISO 21930:2017

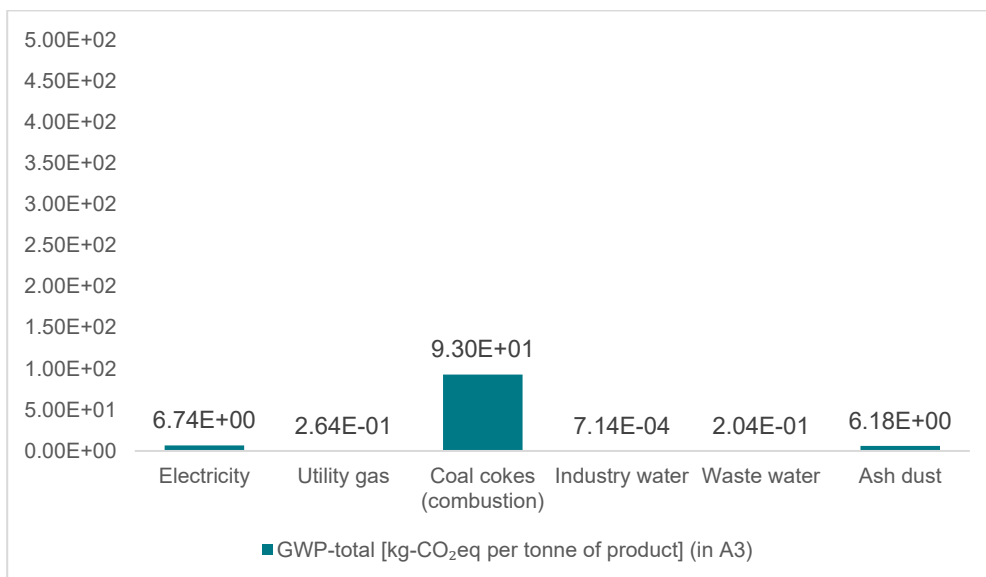
The use of electricity accounts for the largest impact at the GWP-total indicator in A3 module. In conclusion, the electricity usage will be a challenge to reduce the global warming potential.

With using renewable electricity at the manufacturing process, the "Hobozero (Ultra-low CO2 emissions) Hot-Rolled Coil and Checkered Coil" may reduce the GWP from the location-based value 450 kg CO₂-eq per ton to the market-based value 6.74 kg CO₂-eq per ton.

Location base approach



Market base approach



ENVIRONMENTAL PRODUCT DECLARATION



Hobozero (Ultra-low CO2 emissions) Hot Rolled Coil/Checkered Coil
Structural Steel

According to ISO 14025/ISO 21930:2017

References

Ecoinvent v3.10 (EN15804 system) database (2023)

ISO 21930: 2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services

ISO 9001:2015 Quality management systems – Requirements

ISO 14001:2015 Environmental management systems -- Requirements with guidance for use

ISO 14025:2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures

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

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

JIS G 3101: Rolled steels for general structure

JIG G 3106: Rolled steels for welded structure

JIS G 3113: 2018. Hot-rolled steel plate, sheet and strip for automobile structural uses

JIS G 3125: 2021. Superior atmospheric corrosion resisting rolled steels

JIS G 3131: 2018. Hot-rolled mild steel plates, sheet and strip

JIS G 3132: 2018. Hot-rolled carbon steel strip for pipes and tubes

JIG G 3136: Rolled steels for building structure

Life-cycle assessment (LCA) for steel construction, European Commission, 2002

National Greenhouse Gas Inventory Report of Japan 2022, Ministry of the Environment, Japan, Greenhouse Gas Inventory Office of Japan, Center for Global Environmental Research, National Institute for Environmental Studies, Japan

Notification No.1400 by Ministry of Construction Japan: Classification of incombustible materials

SMART EPD® Part A Product Category Rules for Building and Construction Products and Services Standard 1000, version 1.2, March 14, 2025

SMART EPD® Part B Product Category Rules for Designated Steel Construction Products, Standard 1000-008, version 3, April 3, 2025

