ENVIRONMENTAL PRODUCT DECLARATION

HOT ROLLED STRUCTURAL STEEL SECTIONS

SIAM YAMATO STEEL

SYS is the leading manufacturer of hot-rolled structural steel, trusted by customers for over 30 years. With a total annual production capacity of 1.1 million tons from two mills in the eastern region of Thailand, SYS is committed to delivering high-quality products while prioritizing environmental sustainability.

In pursuit of our mission to be “The Best Choice in Southeast Asia,” our products are manufactured using state-of-the-art machinery, supported by a dedicated team of experts to ensure full compliance with our customers’ diverse requirements.

Every SYS product is made from recycled materials through environmentally friendly processes, with strict greenhouse gas emissions control and the use of renewable energy to continuously reduce energy consumption.

Our management system is certified to ISO 9001, ISO 14000, ISO 45001, ISO 50001, TIS 18001, OHSAS 18001, CE Mark, and ABS.

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ENVIRONMENTAL PRODUCT DECLARATION
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ENVIRONMENTAL PRODUCT DECLARATION

SIAM YAMATO STEEL

HOT ROLLED STRUCTURAL STEEL SECTIONS
Section Shape Steel

According to ISO 14025 and ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL ENVIRONMENT 333 PFINGSTEN ROAD NORTHBROOK, IL 60611 HTTPS://WWW.UL.COM/ HTTPS://SPOT.UL.COM/
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	PROGRAM OPERATOR RULES V2.7 2022
MANUFACTURER NAME AND ADDRESS	SIAM YAMATO STEEL COMPANY LIMITED 1 Siam Cement Road, Bangsue, Bangkok 10800 THAILAND
DECLARATION NUMBER	4791632982.101.1
DECLARED PRODUCT & DECLARED UNIT	Section Shape Steel, 1 metric ton
REFERENCE PCR AND VERSION NUMBER	Part A: Calculation Rules for the LCA and Requirements Project Report (UL Environment, V4.0, March 2022) and Part B: Designated Steel Construction Product EPD Requirements (UL Environment, V2.0, 08.26.2020)
DESCRIPTION OF PRODUCT APPLICATION/USE	Various construction applications
PRODUCT RSL DESCRIPTION (IF APPL.)	N/A
MARKETS OF APPLICABILITY	Global
DATE OF ISSUE	July 3, 2025
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-specific
RANGE OF DATASET VARIABILITY	N/A
EPD SCOPE	Cradle to gate
YEAR(S) OF REPORTED PRIMARY DATA	2024
LCA SOFTWARE & VERSION NUMBER	SimaPro 9.6.0.1
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent v3.10 (2024)
LCIA METHODOLOGY & VERSION NUMBER	TRACI v2.1, CML-IA Baseline V3.10

The PCR review was conducted by:	UL Solutions PCR Peer Review Panel
This declaration was independently verified in accordance with ISO 21930:2017 and ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Skye Tang, UL Solutions 
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	ERM Thailand
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	YeonSung Mo, H.I.Pathway Co., LTD. 

HOT ROLLED STRUCTURAL STEEL SECTIONS
Section Shape Steel

According to ISO 14025 and ISO 21930:2017

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: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

1. Product Definition and Information

1.1. Description of Company/Organization

SYS is the leading manufacturer of hot-rolled structural steel, trusted by customers for over 30 years. With a total annual production capacity of 1.1 million tons from two mills in the eastern region of Thailand, SYS is committed to delivering high-quality products while prioritizing environmental sustainability.

As a key part of Thailand's infrastructure and leading construction projects, SYS also exports to more than 20 countries worldwide, serving a wide range of construction needs, including commercial buildings, factories and warehouses, airports and hangars, bridges, transmission towers, and oil refineries.

In response to the growing demand, Steel Solution by SYS was established in 2014 to provide consultancy and a full range of services for hot-rolled structural steel projects by our experience and skillful engineers with a wealth of project experience in using hot-rolled structural steel. They are also dedicated to developing hot-rolled structural steel products that best answers for various application needs in order to rise the Thai construction industry to meet international standards.

In pursuit of our mission to be "The Best Choice in Southeast Asia," our products are manufactured using state-of-the-art machinery, supported by a dedicated team of experts to ensure full compliance with our customers' diverse requirements. Every SYS product is made from recycled materials through environmentally friendly processes, with strict greenhouse gas emissions control and the use of renewable energy to continuously reduce energy consumption.

Our management system is certified to ISO 9001, ISO 14000, ISO 45001, ISO 50001, TIS 18001, OHSAS 18001, CE Mark, and ABS.

1.2. Product Description

Product Identification

Product name: Section shape steel.

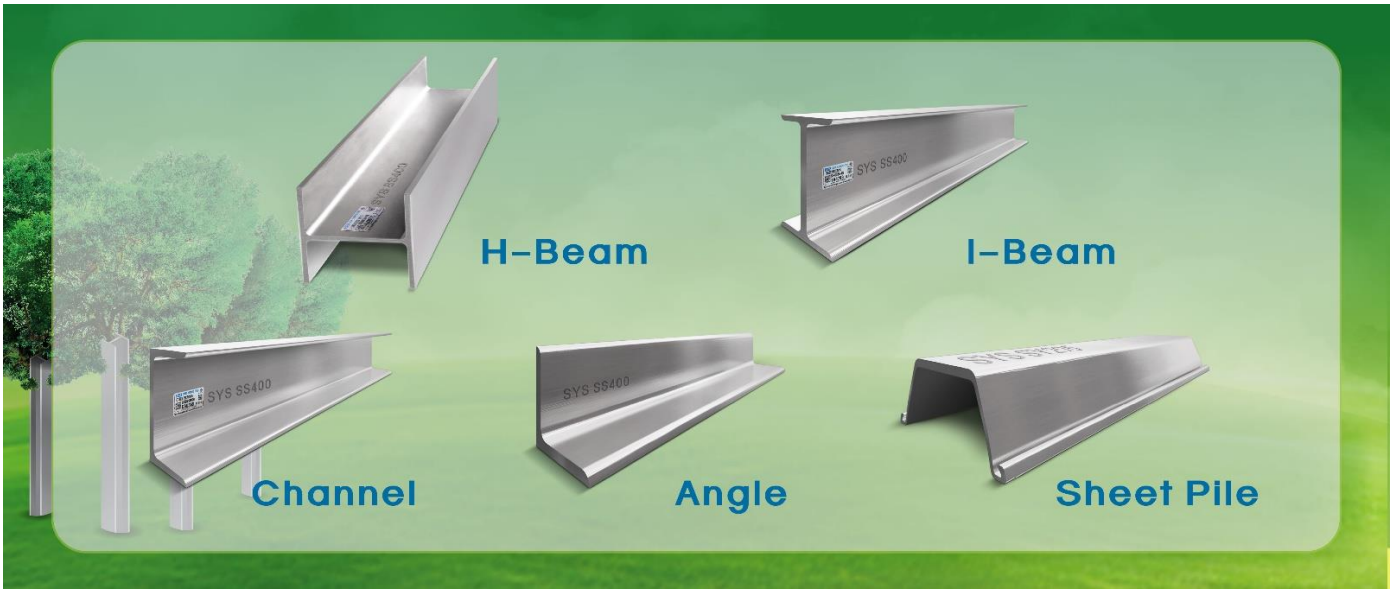
Product Specification

SYS has always adhered to product quality as the core of business operations and carefully controlled the quality in every stage of production. SYS is certified to many standards, such as,

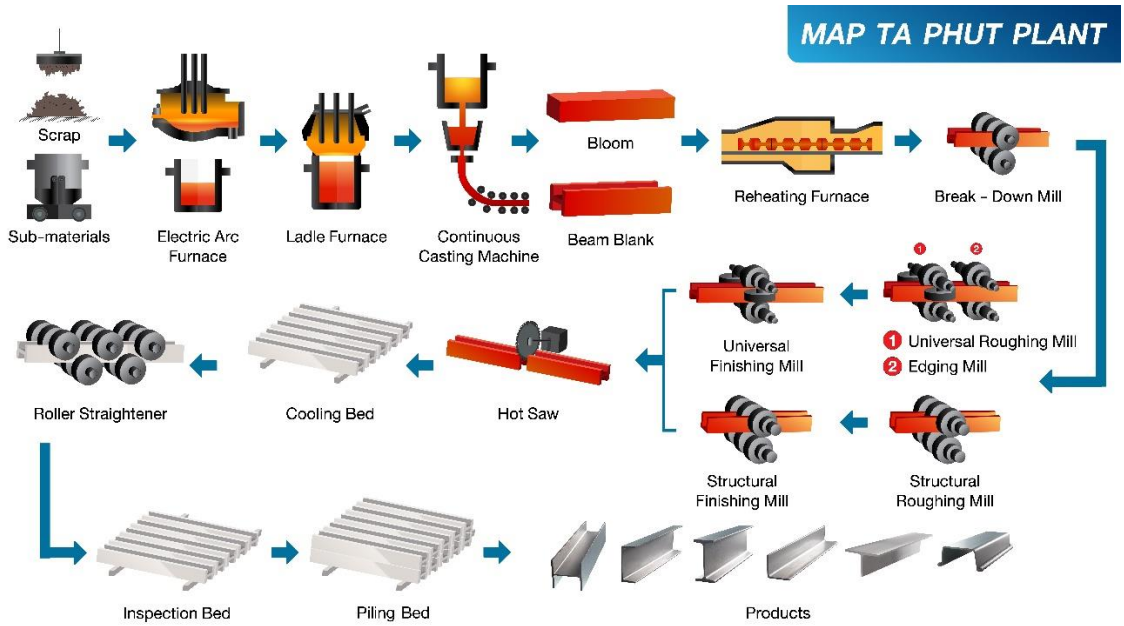
- Thai Industrial Standards (TIS): TIS 1227, TIS 1390
- Japanese Industrial Standards (JIS): JIS G 3101, JIS G 3106, JIS A 5528
- American Society for Testing and Materials (ASTM): ASTM A36/A36M, ASTM A992/A992M, ASTM A572/A572M
- Australian Standard & New Zealand Standard (AS/NZS): AS/NZS 3679.1
- Malaysian Standards (MS): MS EN 10025-2, MS 2674-1
- Indonesian National Standard (SNI): SNI 2610, SNI 07-2054, SNI 07-0052, SNI 07-7178, SNI 07-0329, SNI 8782
- Korean Srandard Association (KS D): KSD 3503, KSD 3515
- British Standards (BS): BS EN 10025-2, BS EN 10248-1

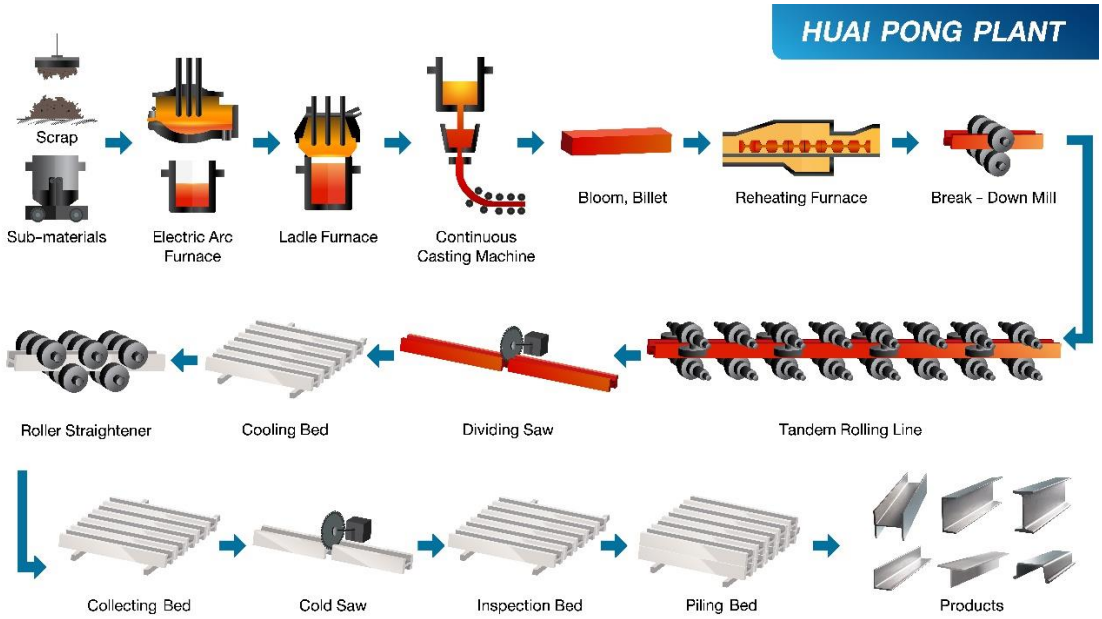
HOT ROLLED STRUCTURAL STEEL SECTIONS
Section Shape Steel

According to ISO 14025 and ISO 21930:2017



Flow Diagram





1.3. Application

The primary function of the structural steel products is to provide strength, stability, and support in various construction and engineering applications. These steel sections are fundamental components in load-bearing structures, ensuring the durability and safety of buildings, bridges, and other infrastructure projects.

Structural steel is chosen for its high strength-to-weight ratio, rigidity, elasticity, and long lifespan, making it an essential material in construction. It allows for efficient design, cost-effective fabrication, and sustainability due to its recyclability and reusability.

Some examples of product applications are as follows:

H Beam: Used as structural pillars, beams, and truss components in construction.

Channel: Commonly used in stair structures and as purlins.

I Beam: Utilized in crane girders and heavy-duty structural frameworks.

Angle: Essential for the construction of transmission line towers and telecom towers.

Sheet Pile: Applied in the construction of retaining walls to prevent soil erosion and runoff.

By providing these critical functions, structural steel sections contribute to the longevity, safety, and sustainability of modern construction and infrastructure.

1.4. Declaration of Methodological Framework

The EPD specifies the following items accoridng to ISO 21930:2017:

- Declared unit of 1 metric ton of section shape steel as described in Section 2.1
- The type of EPD with respect to life cycle stages is "cradle-to-gate". It means "Production stage" including A1: Extraction and upstream production, A2: Transport to factory, and A3: Manufacturing described as described in Section 2.2
- The section shape steel products are manufactured in two EAF plants. The two EAF plants produce the same products through the same production process using the same feedstocks. The results of LCA shows the weighted average of the products manufactured by the two EAF plants.
- The EPD covers "Production stage" only and does not include "Construction", "Use" and "End-of-use" stages.
- Allocation process is applied the EPD as described in Section 2.8.
- Cut-off procedure is described in Section 2.4.
- The technical information and scenarios is described in Section 2 and Section 3. The LCA results based on the scenarios is described in Section 4.

See 2. Life Cycle Assessment Background Information

1.5. Technical Requirements

The section shape steel products meet the requirements shown in Section 1.2 "Product Specification". The property of the product is shown in the following table.

Property	Value	Unit
Density	7,850	Kg/m3
Melting Point	1,493 – 1,460	Celsius
Minimum yield strength	265	MPa
Minimum tensile strength	420	MPa

1.6. Material Composition

The main raw materials are industrial and household scrap metals, by adding alloy steel in production to achieve the desired properties of the product.

1.7. Manufacturing

SYS production process:

1. Scrap metals and other elements are charged into Electric Arc Furnace (EAF),
2. Molten steel is purified at Ladle Furnace (LF) and casted into blooms or beam blanks,
3. Blooms or beam blanks are heated up by reheating furnace to the set temperature and moved forward through each mill stand, rolling into various sizes and thicknesses according to the required standards,
4. The rolled products are cut into customize lengths as per customers' requirements.

These processes will be under Quality Management System, Testing Laboratory Competence, Environmental Management, Occupational Health and Safety Management, and Energy Management from international accreditation agencies, including ISO 9001, ISO 14001, TIS 18001, ISO 45001, ISO 50001, CE Mark, and ABS, etc.

1.8. Packaging

All of the section shape steel product is delivered without any packaging.

1.9. Product Installation

Structural steel is typically installed using various methods depending on the project requirements. Installation involves:

Transportation & Handling: Delivered in sections or prefabricated sections and positioned using cranes and lifting equipment.

Joining Methods: Commonly welded, bolted, or riveted to form a stable structure.

Surface Protection: Coatings such as galvanization or fireproofing may be applied to enhance durability.

Site Safety Considerations: Installation follows industry standards for worker safety and environmental protection.

1.10. Use

The use stage is not considered in this EPD. In the 'normal' conditions, the product would not be replaced during the life time of the building or structure.

1.11. Reference Service Life and Estimated Building Service Life

The reference service life is not specified due to the variety in usage of the products. This LCA focuses only on the production stage.

1.12. Reuse, Recycling, and Energy Recovery

Structural steel is highly sustainable due to its recyclability and reusability:

1.13. Disposal

At the end of its life cycle, structural steel is rarely disposed of in landfills due to its high scrap value, it is normally reused or recycled.

2. Life Cycle Assessment Background Information

2.1. Declared Unit

1 tonne of SYS steel products is defined as declared unit according to ISO 21930:2017.

2.2. System Boundary

The system boundary of section shape steel is “cradle-to-gate”. The stages included in “cradle-to-gate” correspond to A1 to A3 modules as defined in ISO 21930:2017.

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	✓	✓	✓	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

(MND: Module Not Declared)

A1: Extraction and upstream production

- Extraction and upstream production for raw materials including steel scraps and chemicals used for production process and wastewater treatment plant have been included.

A2: Transport to factory

- The transportation of raw materials including steel scraps and chemicals used for production process and wastewater treatment plant.
    - Sea transportation of steel scraps and chemicals: starting from the collection point of the raw materials to the port of the respective country, and from the port in Thailand to the SYS manufacturing sites
    - Land transportation of steel scraps and chemicals: starting from the collection point of the raw materials from sub-dealer location to the SYS manufacturing sites

A3: Manufacturing

- Supply of process utilities, including electricity, process water and natural gas
- Manufacturing process of SYS steel products
- Calcination reaction of dolomite
- Waste and wastewater treatment

2.3. Estimates and Assumptions

No assumptions were made in the impact assessment. All data used in the evaluation were collected from actual measurements.

2.4. Cut-off Criteria

The cut-off criteria for this data are defined below according to ISO 21930:2017 and ISO 14044:2006:

- 1% of renewable primary resource (energy);
- 1% of non-renewable primary resource (energy);
- 1% of total mass input of that unit process;
- 1% of environmental impacts; and/or
- Total neglected input flows per module is 5% or lower of energy usage, mass and environmental impacts.

The data required to conduct this LCIA was fully provided by Siam Yamato Steel. All the data meets the cut-off criteria. However, in order to conduct the LCIA, the background data must be selected properly for each input and output data provided. For this study, background data was collected and reviewed using the Ecoinvent database version 3.10.

Based on the assessment results, Material inputs that are less than 1% and lack sufficient data will not be included in the evaluation. However, the inputs that are cut off must be equal to or less than 5% of energy usage, mass, and environmental impacts, as specified in the cut-off criteria.

2.5. Data Sources

The primary data collected for the LCIA includes the data related to raw material production and procurement, energy generation for use in production, the transport of these products, and the procurement and consumption of energy including utilities used to complete the products during manufacturing. All primary data applied to this assessment were provided by Siam Yamato Steel. Ecoinvent v3.10 is used for the secondary data (background data) for LCIA.

2.6. Data Quality

The primary data provided by SYS meets the time-related, geographical and technological standars for the LCIA and covers all processes included in the system boundary for the LCIA. SYS have achieved ISO 9000 series and ISO 14000 series, and also records and controls all data by SAP system. The precision, completeness, consitensy and reproductivity of data are secured.

Ecoinvent v3.10 used as background data for LCIA is also high quality database for LCIA which is used for LCA or Carbon footprint assessment globally.

The data quality assessment is summerized in the table below.

DATA QUALITY ITEMS	DISCUSSION
Time-Related Coverage	Primary data provided by SYS for this assessment has a reference year of 2024, from January 2024 to December 2024, and covers a sufficient time period for the objectives of this study. Background data referenced from Ecoinvent v3.10 were published in 2024 and are appropriate to use as background data for the primary data.
Geographical Coverage	The primary data provided by SYS are included in the system boundary. The plants that produce the products that are the target of this study and the scrap steel sourced domestically from collection points as well as from ports overseas are covered. Background data referenced from Ecoinvent v3.10 have been selected to be geographically appropriate and cover the same geographic region.
Technological Coverage	The primary data provided by SYS includes all data that covers the material production technology used at the two plants to produce the target products from scrap metal. The technological coverage of the dataset is appropriate for this study.
Precision	SYS has achieved ISO 9000 and ISO 14000 and has implemented a strict management system for information and data related to production and the environment. The primary data provided by SYS for this study are managed under this same management system. The data sources are information output from the core system of SYS, SAP, along with operational information. The data used for this assessment is highly precise and meets the objectives of this study.
Completeness	The primary data provided by SYS for this study include all data pertaining to raw materials, energy and water, outputs to the atmosphere and water, and raw material procurement. There were no missing data needed for the study except the water treatment substance mentioned in 2.4
Representativeness	Primary data provided by SYS for this assessment has a reference year of 2024, covering 12 consecutive months from January 2024 to December 2024. There were no significant accidents or events that occurred in 2021 and may impact the dataset,

DATA QUALITY ITEMS	DISCUSSION
	and operations were as usual. The data covers the entire production process and is sufficiently representative of the process.
Consistency	SYS has achieved ISO 9000 Series and ISO 14000 Series and has implemented a strict document management system. Data has been collected and stored through a consistent methodology based on these. The data provided SYS for this study has been managed in an appropriately consistent method.
Reproductivity	Primary data provided by SYS for this study were managed by and outputted from the core system of SYS, SAP, making this study reproducible.
Sources of the Data	All primary data provided by SYS were recorded using the core system of SYS, SAP, and all secondary data were referenced from Ecoinvent v3.10. Data sources are clearly noted.
Uncertainty of the Information	Primary data provided by SYS for this study were obtained from the production processes at the two plants which produce the target products of this study. Data on raw materials and utilities were recorded through purchase/sales records and onsite data collection and managed by the core system SAP. The reference year for the data, 2024, had normal business operations. The uncertainty for the primary dataset is sufficiently low.

2.7. Period under Review

The period under review is calender year 2024 including 1st January to 31st December 2024.

2.8. Allocation

The Huai Pong Plant and Map Ta Phut Plant have similar production processes. The Map Ta Phut Plant receives blooms/billets from the Huai Pong Plant as well as those produced in-house for further processing into the final product. Note that billets/blooms sold to external parties are outside the scope of this study and are not subject to analysis.

Additionally, in this assessment, the impact allocation is based on the principles of Economic Allocation, which allocates impact according to the sales price. As a result, besides the main product, mill scale and EAF dust are included in the allocation. Waste generated from the production process, such as wastewater sludge and slag, is sent for disposal without any impact allocation to these waste materials.

System expansion was not used in this study, as this LCA does not contain any subject to which the concept would be applicable.

3. Life Cycle Assessment Scenarios

As mentioned in Section 2.2, the system boundary is the “cradle-to-gate”. The scenarios of the life cycle assessment for EPD based on the system boundary are as follows;

- The SYS steel products are manufactured in two electric arc furnace plants including Huai Pong and Map Ta Phut
- Transport of raw materials including steel scraps and chemicals by truck from collecting point of the raw materials to the port of the respective country, and from the port in Thailand by ship and and from the port in Thailand to the SYS manufacturing sites by truck
- The calcination reaction of dolomite consisting of CaCO3 and MgCO3 in manufacturing process of steel is considered
- All hazardous waste including wastewater sludge and non-hazardous waste including slag
- EAF dust and mill scale will be sold to other companies, while other waste, including wastewater sludge and slag, will be properly disposed
- Tap water uses as process water. All of wastewater is treated propoerly in two EAF plants to meet the required rules and regulations of watertreatment
- The SYS steel products are made shipment from the plants without any packaging.

The EAF plants use Calcium carbide which is a regulated hazardous material. It is managed under a proper manner to meet the national rules and regulations. Cacium carbide is not a substance of very high concern.

4. Life Cycle Assessment Results

The life cycle assessment is conducted for the system boundary described in Section 2.2 System Boundary considering the life cycle scenarios described in Section 3 Life Cycle Assessment Scenarios. The impact categories assessed in the life cycle assessment include “Global Warming Potentia (GWP100)l”, “Ozone Depletion Potential (ODP)”, “Eutrophication Potential (EP)", "Acidification Potential (AP)”, “Photochemical Oxidant Creation Potential (POCP)”, “Smog Potential (SP)” and “Abiotic Resource Depletion of Non-renewable Energy Resources (ADPfossil)”, accouding to ISO 21930:2017. The results of life cycle assessment are shown for A1, A1, A3 and total of A1 to A3.

4.1. Life Cycle Impact Assessment Results

The Results of Life Cycle Assessment

The following indicators shows the weighted average of the results of two plants; Huai Pong Plant and Map Ta Phut Plant.

IMPACT CATEGORIES	INDICATORS	A1	A2	A3	TOTAL OF A1 TO A3	METHODS
Global Warming Potential (GWP100)	kg-CO2 eq	7.85E+01	6.48E+01	4.80E+02	6.23E+02	IPCC2021 GWP100
Global Warming Potential (GWP)	kg-CO2 eq	7.68E+01	6.41E+01	4.78E+02	6.19E+02	TRACI 2.1
Ozone Depletion Potential (ODP)	kg-CFC11 eq	1.20E-06	1.18E-06	1.49E-05	1.73E-05	TRACI 2.1
Eutrophication Potential (EP)	kg-N eq	4.33E-02	2.22E-02	3.14E-01	3.80E-01	TRACI 2.1
Acidification Potential (AP)	kg-SO2 eq	3.31E-01	2.76E-01	1.45E+00	2.05E+00	TRACI 2.1
Photochemical Oxidant Creation Potential (POCP)	kg C2H4 eq	3.13E-02	1.08E-02	6.57E-02	1.08E-01	CML-IA Baseline V3.10
Smog Formation (Potential)	kg O3 eq	2.93E+00	7.17E+00	1.93E+01	2.94E+01	TRACI 2.1
Abiotic Resource Depletion Potential of Non-renewable (Fossil) Energy Resources (ADPfossil)	MJ, LHV	1.28E+03	9.11E+02	7.47E+03	9.67E+03	CML-IA Baseline V3.10

These six impact categories, except for ADPfossil, are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

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.

4.2. Life Cycle Inventory Results

For non-renewable primary resources used as an energy carrier, this study utilizes the Abiotic Depletion (fossil fuels) category from the CML-IA baseline V3.10 / World 2000 Method to identify the energy used per 1 metric ton of product. Regarding secondary materials, SYS uses steel scrap as a raw material to reduce the use of virgin materials and minimize environmental impact. Additionally, production waste such as scrap returns is recycled by reintroducing it into the production process.

Energy and Resource Use

RESOURCE USE FLOWS	A1	A2	A3	TOTAL OF A1 TO A3
Renewable Primary Resoures used as an Energy Carrier [Mj, net calorific value]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable Primary Resourses with Energy Content used as Material [Mj, net calorific value]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable Primary Resources used as an Energy Carrier [Mj, net calorific value]	1.28E+03	9.11E+02	1.30E+03	3.50E+03
Non-renewable Primary Resources with Energy Content used as Material [Mj, net calorific value]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary Materials [kg]	1.15E+03	0.00E+00	0.00E+00	1.15E+03
Renewable Secondary Materials [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable Secondary Fuels [Mj, net calorific value]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable Secondary Fuels [Mj, net calorific value]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered Energy [Mj, net calorific value]	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Waste and Output Flows

WASTE AND OUTPUT	UNIT	A1	A2	A3	TOTAL OF A1 TO A3
Hazardous Waste Disposed	Metric ton	0.00E+00	0.00E+00	1.94E+00	1.94E+00
Non-hazardous Waste Disposed	Metric ton	0.00E+00	0.00E+00	1.91E+02	1.91E+02
High-level Radioactive Waste, conditioned, to final respository	Metric ton	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Components for re-use	Metric ton	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	Metric ton	0.00E+00	0.00E+00	5.56E-02	5.56E-02
Materials for Energy Recovery	Metric ton	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported Energy	MJ per energy carrier	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Additional CO2 emissions

	UNIT	A1	A2	A3
CO2 Emission from Calcination	t-CO2/metric ton	0.00E+00	0.00E+00	1.00E-02

Note: the biogenic carbon, carbonation, and emissions from combustion of waste are not relevant to the product system.

Consumption of Freshwater

	UNIT	A1	A2	A3
Water Consumption	M3/metric ton	0.00E+00	0.00E+00	1.28E+00

5. LCA Interpretation

LCA Interpretation

The analysis results indicate that the A3: Manufacturing stage has the highest environmental impact across all categories. This is primarily due to the use of an electric arc furnace to melt steel scrap, a process that requires extremely high temperatures and consequently consumes a large amount of electricity. The significant electricity consumption leads to substantial environmental impacts, including high levels of greenhouse gas emissions. Furthermore, natural gas is utilized in the production of products both in the Bloom & Billet manufacturing process and in the final product manufacturing, which contributes to the environmental impact. The combustion of natural gas contributes notably to the Global Warming Potential, exacerbating the overall environmental impact of the manufacturing process. These factors combined make the A3: Manufacturing stage the most environmentally intensive part of the production lifecycle.

Additionally, for the impacts arising from A2: Transportation, the most significant effects, compared to the overall proportion, occur in Smog. This is primarily due to the use of fuel as the energy source for transportation, both domestically and internationally. The combustion of fuel in vehicles leads to the emission of various pollutants into the atmosphere, including nitrogen oxides (NOx) and volatile organic compounds (VOCs). These pollutants are key contributors to the formation of smog, which can have adverse effects on air quality and human health. The effects of this pollutants make transportation a significant contributor to environmental impacts, particularly in terms of Smog contribution

Regarding Global Warming Potential, which is a significant environmental impact, A1 contributes 12.6%, A2 contributes 10.4%, and A3 contributes 77%. Since A3 has the greatest contribution to this factor, a sensitivity analysis has been conducted for Global Warming Potential.

Sensitivity analysis

The results of the sensitivity analysis indicate that the company may use renewable energy fuel and/or use the electricity that derives from renewable energy sources. This can significantly reduce GHG emissions of the production porcess (A3). Additionally, the findings suggest that reducing energy consumption during production can help lower GHG emissions, as the majority of the impact stems from electricity usage.

However, the GHG emission factor of grid electricity in Thailand, according to the IEA, may be higher compared to other countries. For example, using the GHG emission factor of Japan, which is lower than that of Thailand, for LCA decreases the total Global Warming Potential of the A3 module by 6%. Additionally, when compared to Austria, a country with a very low emission factor due to its high proportion of renewable energy use, the total Global Warming Potential of the A3 module decreases by 62%. This comparison highlights that procuring electricity with a lower GHG emission factor is crucial for reducing the impact on climate change. Moreover, reducing energy consumption or improving energy efficiency are also viable options to help reduce environmental 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. Given this PCR ensures products meet the same functional requirements, comparability is permissible provided the information given for such comparison is transparent and the limitations of comparability explained.

When comparing EPDs created using this PCR, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared.

6. References

ISO 14040:2016, Environmental management - Life Cycle Assessment- Principles and framework

ISO 14044:2006, Environmental management - Life Cycle Assessment- Requirements and guidelines

ISO 14025:2010, 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

UL 10010 Version 4.0 Product Category Rules for Building-Related Products and Services in: Brazil, China, Europe, India, Japan, Korea, North America and South East Asia.

UL 10010-34 Version 2.0 Product Category Rule Guidance for Building-Related Products and Services Part B: Designated Steel Construction Product EPD Requirements

IEA Electricity Emission Factor Year 2024

TRACI 2.1 V1.09 / US 2008

CML-IA Baseline V3.10

Ecoinvent Ver 3.10 (2024)

Siam Yamato Steel Company website: https://www.syssteel.com/en/

Product information: https://www.syssteel.com/en/product/

Product Catalogue: https://www.syssteel.com/wp-content/uploads/2023/06/SYS-Catalog-Inter_Effective-June-2023.pdf

Certificate: https://www.syssteel.com/en/certificate/