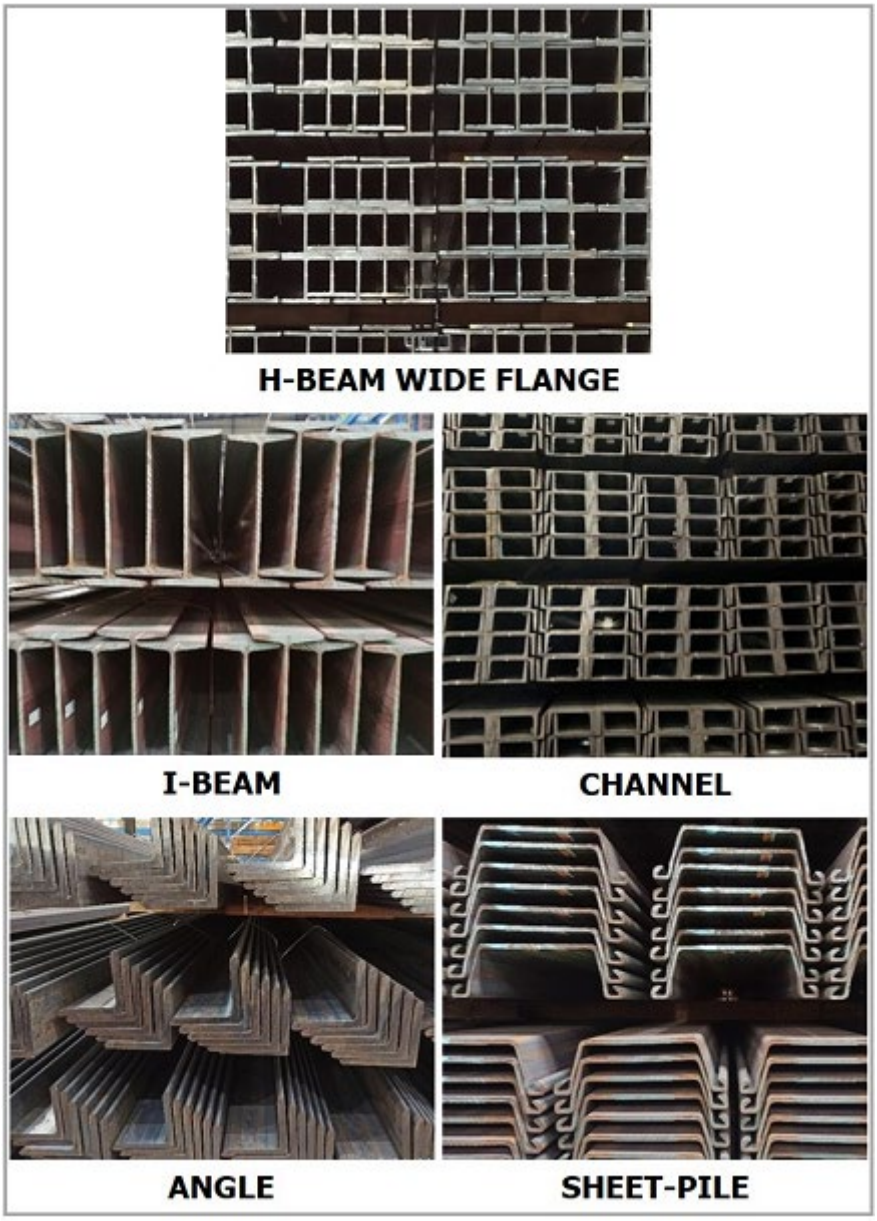
Environmental Product Declaration

Hot Rolled Structural Steel Sections



SIAM YAMATO STEEL

SYS is the leading manufacturer of hot rolled structural steel with the total annual capacity of 1.1 million tons from two mills in the eastern region of Thailand.

Not only crafting our supply to support the growth of Thailand economy, but SYS also has been exporting to more than 20 countries worldwide for over 25 years to serve various construction projects such as commercial building, factory and warehouse, airport and hangar, bridge, transmission tower oil refinery.

In pursuance of our mission to be "The best choice in Southeast Asia", our products are made from state of the art machinery with dedication of our expert team to ensure full compliance with various requirements from our customers. Our management system has been certified to ISO9001, ISO14000, TIS18001, OHSAS18001, CE Mark and ABS.

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

SIAM YAMATO STEEL

HOT ROLLED STRUCTURAL STEEL SECTIONS
Section Shape Steel

CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

According to ISO 14025 and ISO21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL ENVIRONMENT 333PFINGSTEN RD, NORTHBROOK, IL 60062 WWW.UL.COM WWW.SPOT.UL.COM
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022
MANUFACTURER NAME AND ADDRESS	SIAM YAMATO STEEL COMPANY LIMITED 1 Siam Cement Road, Bangsue, Bangkok 10800 THAILAND
DECLARATION NUMBER	4790592035.101.1
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 1, 2023
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	2021
LCA SOFTWARE & VERSION NUMBER	SimaPro 9.4.0.3
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent v3.8 (2021)
LCIA METHODOLOGY & VERSION NUMBER	TRACI version 2.1 and CML2001

The PCR review was conducted by:	UL Environment PCR Panel Review epd@ul.com
This declaration was independently verified in accordance with ISO 21930:2017 and ISO 14025: 2006. ☐ INTERNAL ☑ EXTERNAL	Cooper McCollum Cooper McCollum, UL Environment
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	ERM
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine, Thrive ESG

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

Siam Yamato Steel Co.,Ltd (SYS) has manufactured hot -rolled structural steel since 1992. Over the years, SYS realize that producing and supplying of excellent quality hot-rolled structural steel have fallen short of addressing customers' latent needs. As there are some limitations on the knowledge related to structural steel work. These include applying suitable applications for hot-rolled structural steel, fabrication of structural steelwork that meets high standards, to the erection of steelwork in combination with other structures, and preparing steel components that withstand different environmental conditions and requirements.

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.

"Efficient use of hot-rolled structural steel requires good management, professional structural design, high standard fabrication, and precise erection, which ensure the safest and most cost-effective use of hot-rolled structural steel."

1.2. Product Description

Product Identification

Product name: Section shape steel.

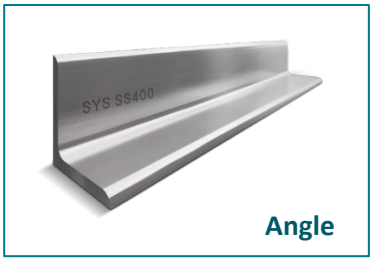
Product Specification

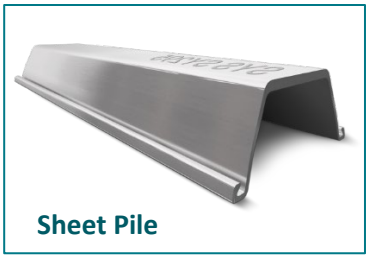
SYS has always adhered to product quality as the core of business operations and carefully controlled the quality in every stage of production. SYS is certified to many standards, such as,

- Thai Industrial Standards (TIS): TIS 1227, TIS 1390
- Japanese Industrial Standards (JIS): JIS G 3192, JIS A 5526, JIS A 5528
- European Standards (EN): EN 10025
- American Society for Testing and Materials (ASTM): ASTM A6/A6M
- Australian Standard & New Zealand Standard (AS/NZS): AS/NZS 3679
- Malaysian Standards (MS): MS 2674-1
- Indonesian National Standard (SNI): SNI 2610, SNI 07-2054, SNI 07-0052, SNI 07-7178.

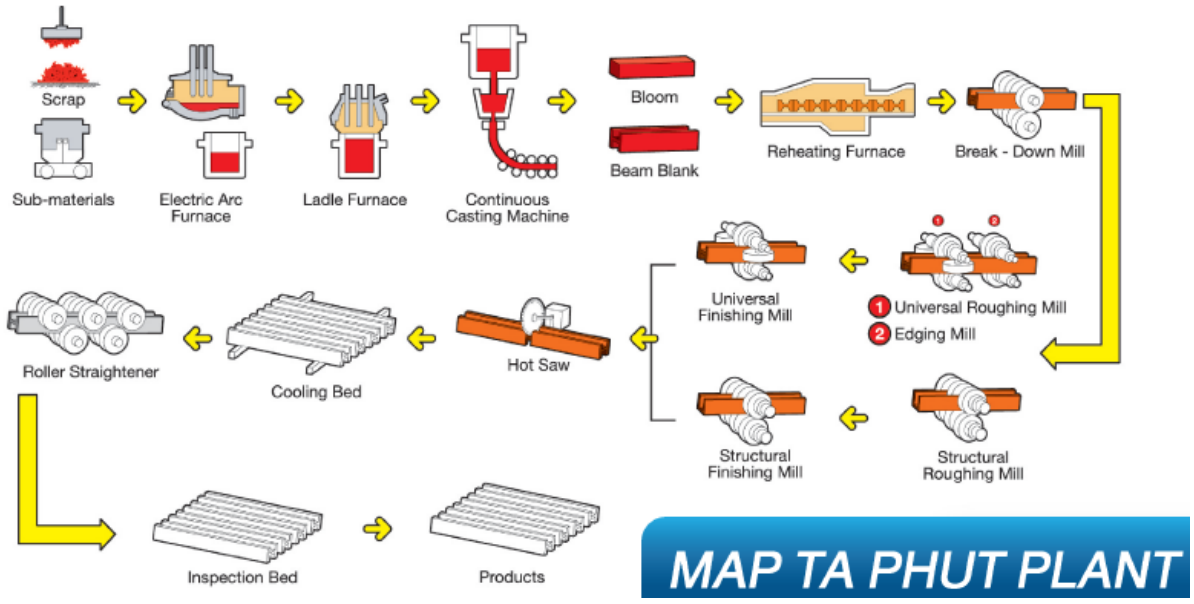
HOT ROLLED STRUCTURAL STEEL SECTIONS
Section Shape Steel

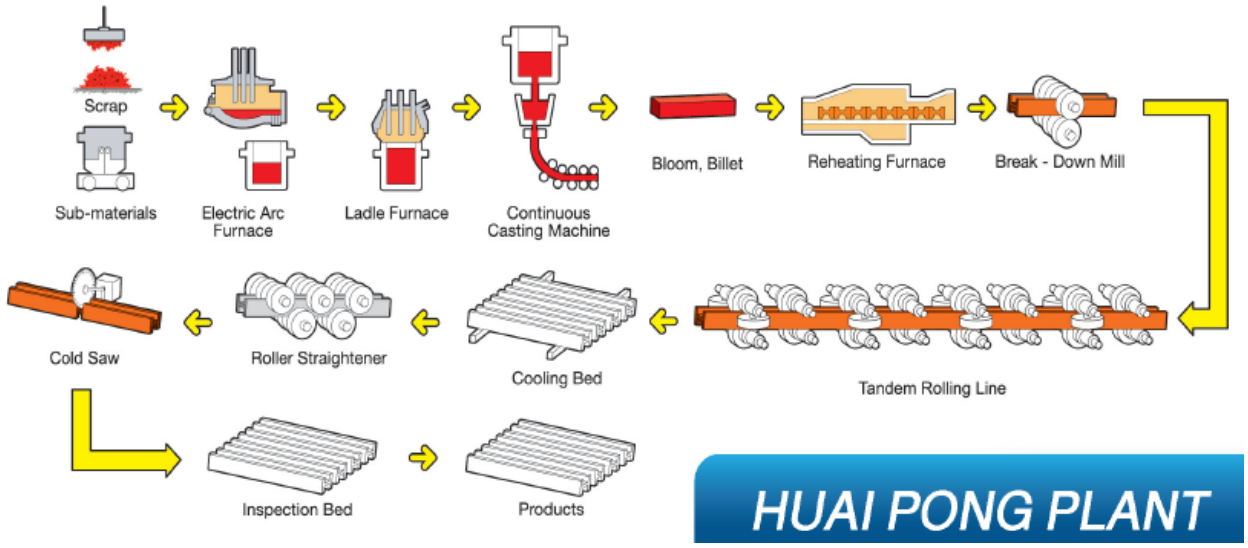
According to ISO 14025 and ISO 21930:2017





Flow Diagram





1.3. Application

According to outstanding mechanical property, such as, rigidity, high strength to weight ratio and high elasticity, SYS structural steel can serve various construction application, such as, warehouses, aircraft hangar, commercial building, bridge to transmission tower, etc.

Some examples of product applications are as follows:

H Beam: Used as construction work pillar, beam and truss structure.

Channel: Used as a part of stairs and purlins

I Beam: Used for parts of groove crane.

Angle: Used for construction of transmission line tower and telecom towers

Sheet pile: Used for the construction of retaining walls for soil erosion and run off prevention.

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 shap 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	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 charging into Electric Arc Furnace (EAF),
2. Molten steel is purified at Ladle Furnace (LF) and casted into bloom or beam Blank,
3. Bloom or beam blank are heated up by reheating furnace to target temperature and moved forward through each mill stand, rolling into various sizes and thickness according to required standards,
4. The rolled products shall be cut into customize lengths as per customers’ required.

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

1.8. Packaging

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

1.9. Product Installation

The product has to be installed by the recognized rules of engineering (or structural calculation) and the manufacturer's recommendations. In addition, standard safety measures should be applied during handling and use of the product.

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

It is possible that the product is reused although depending on how it is installed. Unless reused, the product can be recycled since steel is 100% recycable.

1.13. Disposal

The end of life stage is not considered in this EPD. Because steel scrap has high value, it is usually reused or recycled instead of diposed.

Waste code of the Basel Convention: A1010.

2. Life Cycle Assessment Background Information

2.1. Declared Unit

1 metric ton of section shape steel 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: Raw material supply

- Extraction and upstream production for raw materials including scrap steels

A2: Transport of scrap steel from suppliers to the factories

- Sea transportation of steel scrap in the country and from the foreign contries
- Land transportation of scarp and auxiliary materials in home and abroad

A3: Producing process of the section shape steel

- Prodution process utilities, including compressed air, cooling water, process gases, steam, etc.
- Supply of process utilities, including electricity, process water and natural gas
- Manufacturing process of section shape steel products at the Electric Arc Furnace (EAF)
- Calcination reaction of dolomite
- Waste and waste water treatment

2.3. Estimates and Assumptions

As for the transportation of scap steel from abroad to Thailand by marine vessel, the distance of transporting by vessels is decided in a highly conservative manner to select the furthest way between ports. About the transportation of scrap steel by truck from collecting point to port in foreign countries, the distance of the transportation is assumed to be 200 km for truck transportation in all foreign countries.

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 3.8.

As a result, one type of substance used in water treatment had no applicable secondary data available in the Ecoinvent database. Annually, 0.325 t of this substance is used at one EAF plant, which is lower than the cut-off criteria. Therefore, this substance was excluded from this assessment.

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 v3.8 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 v3.8 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 2021,

	from January 2021 to December 2021, and covers a sufficient time period for the objectives of this study. Background data referenced from Ecoinvent v3.8 were published in 2021 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 v3.8 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 2021, covering 12 consecutive months from January 2021 to December 2021. There were no significant accidents or events that occurred in 2021 and may impact the dataset, 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 v3.8. 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, 2021, 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 2021 including 1st January to 31st December 2021.

2.8. Allocation

Of the two plants included in this assessment, the Huai Pong Plant produces bloom/billet as an intermediate product, of which a portion is sold to an external party, another portion is sent to the Map Ta Phut Plant, and finally, another portion is kept as operationally required stock to be used as ingredients when manufacturing the final product. After receiving bloom/billet from the Huai Pong Plant, the Map Ta Phut Plant keeps a portion of this bloom/billet, along with bloom/billet produced at their own plant, as operationally required stock to be used as ingredients when manufacturing the final product.

To effectively allocate resources in this assessment, the A3 module has been split into two processes: the upstream process A3-1 where bloom/billet is produced and the downstream process A3-2 where the final product is manufactured using bloom/billet. These modules are assessed separately in this study, and the results combined at the end. Note that billet/bloom sold to an external party is outside of the scope of this study and is not subject to be studied.

All waste from the manufacturing process including slag, mill scale, EAF dust and wastewater sludge are recycled or reused. But no allocation is applied to those 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 section shape steel is manufactured in two electric arc furnace plants including Huai Pong and Map Ta Phut
- Transport of scrap steel by truck from collecting point to port in foreign countries and transport of the scrap steel by ship to Thailand
- Transport of scrap steel by truck from collecting point and port to the plants in Thailand
- Transport of auxiliary materils by truck to the plants in Thailand
- The calcination reaction of dolomite consisting of CaCO3 and MgCO3 in manufacturing process of steel is considered
- All hazardous waste including EAF dust and wastewater sludge and non-hazardous waste including slag and mill scale are reused or recycled. No hazardous and non-hazadous waste are sent to landfill site
- 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 section shape steel is 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	1.15E+02	1.31E+02	6.45E+02	8.90E+02	IPCC2001 GWP100
Global Warming Potential (GWP)	kg-CO2 eq	1.14E+02	1.30E+02	6.39E+02	8.83E+02	TRACI 2.1
Ozone Depletion Potential (ODP)	kg-CFC11 eq	2.38E-05	2.89E-05	3.90E-05	9.18E-05	TRACI 2.1
Eutrophication Potential (EP)	kg-N eq	5.94E-01	1.72E-01	2.57E+00	3.34E+00	TRACI 2.1
Acidification Potential (AP)	kg-SO2 eq	9.01E-01	2.30E+00	1.56E+00	4.76E+00	TRACI 2.1
Photochemical Oxidant Creation Potential (POCP)	kg C2H4 eq	5.43E-02	5.68E-02	7.27E-02	1.84E-01	CML-IA Baseline V3.08
Smog Formation (Potential)	kg O3 eq	8.24E+00	4.42E+01	1.92E+01	7.16E+01	TRACI 2.1
Abiotic Resource Depletion Potential of Non-renewable (Fossil) Energy Resourses (ADPfossil)	MJ, LHV	1.94E+03	1.79E+03	8.17E+03	1.19E+04	CML-IA Baseline V3.08

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

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]	2.31E+02	1.73E+3	1.97E+03	3.93E+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]	1.16E+03	0.00E+00	0.00E+00	1.16E+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
Non-hazardous Waste Disposed	Metric ton		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hazardous Waste Disposed	Metric ton		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Radioactive Waste Disposed	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	Non hazardous	0.00E+00	0.00E+00	2.00E-01	2.00E-01
		Hazardous	0.00E+00	0.00E+00	1.94E-02	1.94E-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	1.16E-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	TOTAL
Water Consumption	M3/metric ton	4.30E-01	0.00E+00	1.05E+00	1.48E+00

5. LCA Interpretation

LCA Interpretation

With the exception of acidification and smog formation, for all categories, A3: Manufacturing was the module with the highest contribution. This is due to the fact that during the production process where the electric arc furnace for melting the scrap steel, a significant amount of electricity is consumed. Additionally, as the main raw material is scrap steel, for module A1, the environmental impact is lower than a process using natural materials. This is believed to be another factor explaining the large portion of impact attributed to the A3 module.

The A2 module was the greatest contributor to environmental impact for acidification and smog. It has also a big factor of impact in Ozon Depletion Potential and Photochemical Oxidant Creation Potential . This is likely because during the transportation of scrap steel domestically and internationally, the transportation methods are mainly reliant on diesel engines, where internal combustion engines burn fossil fuels and release atmospheric pollutants. These pollutants are the cause of the environmental impacts in terms of those indexes.

For Global Warming Potential, which is an environmental impact category that has been receiving the most attention in recent years, A1 comprised 12.9% of the impact, A2 14.7%, and A3 72.4%. As A3 has the greatest contribution to this factor, a sensitivity analysis has been conducted for Global Warming Potential.

Sensitivity analysis

In terms of Global Warming Potential, Contributors of A3 module include water, electricity, natural gas and calcination of dolomite. Comparing A1, A2, A3: water, A3: Electricity, A3: Natural Gas and A3: Calcination, A3: Electricity has the largest impact on Global Warming Potential and it account for 57% of total Global Warming Potential.

The GHG emission factor of grid electricity in Thailand is relatively high. For example, the GHG emission factor of Austria which is lower by 55% than that of Thailand is used for LCA. The total Global Warming Potential of A3 module is decreased by 42%. The procurement of electricity with lower GHG emission factor is important to reduce the impact on climate change.

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

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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/