Environmental Product Declaration

Hot Rolled Coil

G Steel Public Company Limited is a leading manufacturer of hot-rolled steel coil (HRC) in Thailand, with an integrated production facility that spans melting, casting, and rolling in a single location. Utilizing Electric Arc Furnace (EAF) technology, G Steel delivers high-quality flat steel products with a lower environmental footprint compared to conventional blast furnace routes.

With an annual production capacity of 1.5 million tons, G Steel serves a diverse range of industries—from construction and automotive to machinery and infrastructure. As part of Nippon Steel Corporation, one of the world's largest steel producers, G Steel is committed to innovation, sustainability, and strengthening the regional steel supply chain.

Our management systems are certified to ISO 9001, ISO 14001, ISO 45001, and CE Mark

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

GSteel

HOT ROLLED COIL

CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION ULCOM/EPD

According to ISO 14025 and ISO21930:2017

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	G Steel Public Company Limited 88 PASO Tower 18th Floor Silom Road,Suriyawong, Bangrak, Bangkok 10500
DECLARATION NUMBER	4791865111.101.1
DECLARED PRODUCT & DECLARED UNIT	Hot Rolled Coil 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	September 8. 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	2023
LCA SOFTWARE & VERSION NUMBER	SimaPro 9.6.0.1
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent v3.10 (2023)
LCIA METHODOLOGY & VERSION NUMBER	TRACI v2.1, CML-IA Baseline V3.10

The PCR review was conducted by:	UL environment PCR Peer Review Panel Dr. Tom Gloria, Chair
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.

ENVIRONMENTAL PRODUCT DECLARATION

GSteel

HOT ROLLED COILL

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.

HOT ROLLED COILL

According to ISO 14025 and ISO 21930:2017

1. Product Definition and Information

1.1. Description of Company/Organization

G Steel Public Company Limited is a leading manufacturer of hot-rolled steel coil (HRC) in Thailand, with an integrated production facility that spans melting, casting, and rolling in a single location. Utilizing Electric Arc Furnace (EAF) technology, G Steel delivers high-quality flat steel products with a lower environmental footprint compared to conventional blast furnace routes.

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1.2. Product Description

Product Identification

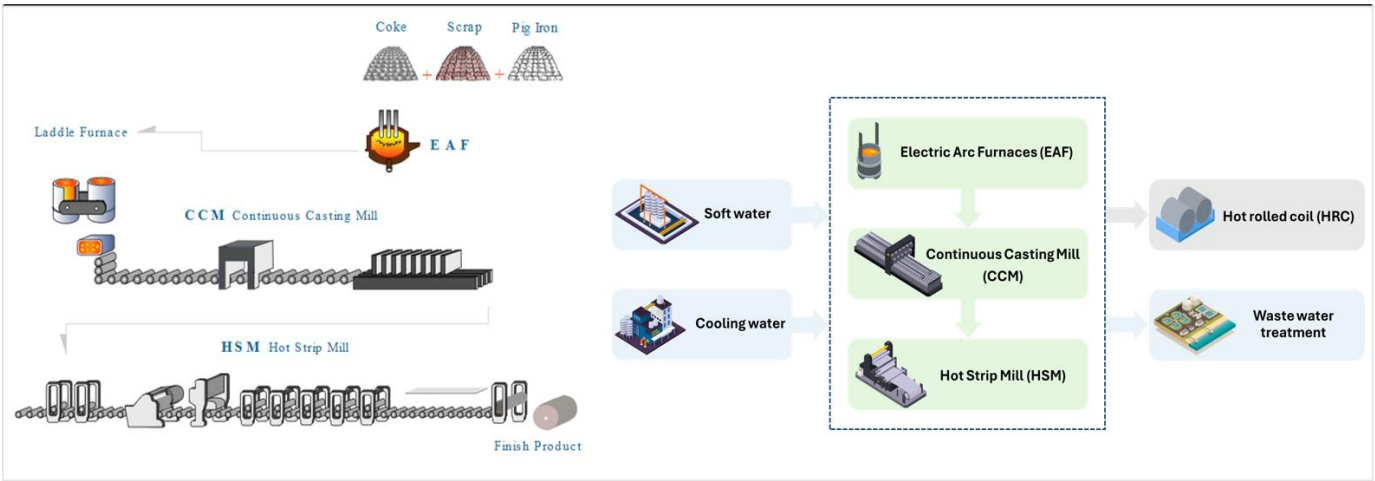
Product name: Hot Rolled Coil

Product Specification

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

- Thailand Industrial Standard (TIS): TIS528, TIS1479, TIS1499, TIS1735, TIS1884, TIS1999, TIS2060
- Japanese Industrial Standard (JIS): G3101, JIS G3106, JIS G3131, G3132, G3113, G3116
- American Society for Testing and Materials (ASTM): ASTM A36M, ASTM A283M, ASTM 572M
- European Standard (EN): EN 10025-2
- SIRIM PCL: MS EN 10025-2, MS 1705, MS 1768, SAE J 403

Flow Diagram



1.3. Application

The primary function of **Hot Rolled Steel Coils (HRC)** produced by G Steel is to serve as a key raw material in a wide range of structural, construction, and industrial applications. These coils are processed into various steel sections and components that form the backbone of buildings, bridges, machinery, and infrastructure systems.

Hot rolled steel is preferred for its **high strength**, **formability**, **cost-efficiency**, and **recyclability**, making it an ideal material for fabrication and manufacturing processes.

Common downstream applications of G Steel's HRC include:

- **Structural Steel Sections**
  Used in the production of H-Beams, I-Beams, Channels, and Angles for construction frameworks.
- **Pipe and Tube Manufacturing**
  For structural, water, gas, and oil transportation systems.
- **Automotive Components**
  Such as chassis frames, brackets, and reinforcements.
- **Storage Tanks and Pressure Vessels**
  In industries such as energy, petrochemicals, and agriculture.
- **Machinery Parts and Heavy Equipment**
  Including base frames and fabricated components.

By serving as the foundation for these critical components, G Steel's hot rolled coils contribute to the **durability**, **efficiency**, and **sustainability** of modern industrial and infrastructure development.

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	1,538	Celsius
Minimum yield strength	205	MPa
Minimum tensile strength	330	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

G Steel's hot rolled coil production process consists of the following key stages:

1. Scrap steel and alloying materials are charged into the Electric Arc Furnace (EAF), where the metal is melted using high-temperature electric arcs.
2. The molten steel is then refined in the Ladle Furnace (LF) to adjust its chemical composition and temperature before casting.
3. The purified molten steel is continuously cast into slabs through a Continuous Casting Machine (CCM).
4. The steel slabs are reheated in a Reheating Furnace, then passed through a Hot Strip Mill where they are rolled into coils of desired thickness and width.
5. The finished Hot Rolled Coils (HRC) are coiled and cut into specified lengths based on customer requirements.

These processes will be under Quality Management System, Environmental Management, and Occupational Health and Safety Management from international accreditation agencies, including ISO 9001, ISO 14001, ISO 45001 and CE Mark.

1.8. Packaging

All of the hot rolled coil products are delivered without any packaging.

1.9. Product Installation

Hot Rolled Steel Coils (HRC) from G Steel are typically processed into downstream products—such as structural sections, pipes, or components—and installed according to specific project requirements. The installation process generally includes:

- **Transportation & Handling:**
  Coils or fabricated products derived from HRC are transported to the site using flatbed trucks or containers and handled with cranes, forklifts, or coil lifters to ensure safe positioning.
- **Forming & Joining Methods:**
  After processing, the steel is welded, bolted, or riveted into structural systems, frames, or assemblies as part of construction or industrial installations.
- **Surface Treatment & Protection:**
  Depending on the application, HRC-derived products may be galvanized, painted, or coated with fireproofing materials to enhance corrosion resistance and longevity.
- **Site Safety & Compliance:**
  All installation activities are carried out following industry regulations for safety, environmental impact, and quality assurance, in line with international standards and client specifications.

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

Hot Rolled Coil (HRC) steel is highly sustainable due to its recyclability and reusability

1.13. Disposal

At the end of its life cycle, Hot Rolled coil 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 metric tonne of G 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 G Steel manufacturing sites
    - Land transportation of steel scraps and chemicals: starting from the collection point of the raw materials from sub-dealer location to the G Steel manufacturing sites

A3: Manufacturing

- Supply of process utilities, including electricity, process water and natural gas
- Manufacturing process of G 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 G Steel Public Company Limited. 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 G Steel Public Company Limited. Ecoinvent v3.10 is used for the secondary data (background data) for LCIA.

2.6. Data Quality

The primary data provided by G Steel meets the time-related, geographical and technological standars for the LCIA and covers all processes included in the system boundary for the LCIA. G Steel 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 G Steel for this assessment has a reference year of 2023, from January 2023 to December 2023, and covers a sufficient time period for the objectives of this study. Background data referenced from Ecoinvent v3.10 were published in 2023 and are appropriate to use as background data for the primary data.
Geographical Coverage	The primary data provided by G Steel are included in the system boundary. The plants that produce the products that are the target of this study, and the steel scrap 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 G Steel 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	G Steel 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 G Steel for this study are managed under this same management system. The data sources are information output from the core system of G Steel, 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 G Steel 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.
Representativeness	Primary data provided by G Steel for this assessment has a reference year of 2023, covering 12 consecutive months from January 2023 to December 2023. There were no significant accidents or events that occurred in 2023 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	G Steel 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 G Steel for this study has been managed in an appropriately consistent method.
Reproductivity	All The primary data provided by G Steel for this study were managed and extracted from G Steel's internal system, which is highly reliable and ensures data reproducibility
Sources of the Data	All The primary data provided by G Steel for this study were managed and extracted from G Steel's internal system, which is highly reliable.
Uncertainty of the Information	The primary data used in this study are actual production data from G Steel, managed through a highly reliable and standardized internal system. As a result, the

	uncertainty associated with the primary dataset is sufficiently low.

2.7. Period under Review

The period under review is calender year 2023 including 1st January to 31st December 2023.

2.8. Allocation

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, 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 G Steel products are manufactured in electric arc furnace plants, resulting in liquid metal, which then enters the Continuous Casting (CCM) to produce slabs. These slabs are subsequently processed through the Hot Strip Mill (HSM) to produce Hot Rolled Coils (HRC). For customers requiring customized sizing, the HRCs are further processed through the skinpass stage
- Transport of raw materials including steel scraps, sub-raw materials, fluxes, alloys and utility chemical 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 G Steel manufacturing sites by truck.
- In the 2023 evaluation of the steel manufacturing process, the calcination of dolomite comprising calcium carbonate ($CaCO_3$) and magnesium carbonate ($MgCO_3$) was considered as G steel uses limestone and dolomite that has already undergone calcination before being used as a raw material. However, starting in 2024, G Steel has discontinued the use of raw dolomite ($CaMg(CO_3)_2$) in its production process. Instead, burnt dolomite ($CaO{\cdot}MgO$) is utilized as a flux during the refining process and to provide protection for refractory linings.
- All hazardous waste including wastewater sludge and non-hazardous waste including slag
- EAF dust and scale will be sent for recycling by licensed weast management 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 wastewater treatment plants to meet the required rules and regulations of watertreatment
- The G Steel products are made shipment from the plants without any packaging.

The company rigorously manages various hazardous substances in compliance with international standards, including OSHA, GHS, and applicable local regulations. This comprehensive approach encompasses accurate identification, secure storage, safe handling, thorough employee training, and proper disposal, all aimed at safeguarding health and the environment.

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 show the weighted average of the results of the results for the Hot Rolled Coil (with skinpass) and Hot Rolled Coil (Without skinpass).

IMPACT CATEGORIES	INDICATORS	A1	A2	A3	TOTAL OF A1 TO A3	METHODS
Global Warming Potential (GWP100)	kg-CO2 eq	2.48E+02	4.22E+01	5.22E+02	8.12E+02	IPCC2001 GWP100
Global Warming Potential (GWP)	kg-CO2 eq	2.42E+02	4.18E+01	5.19E+02	8.03E+02	TRACI 2.1
Ozone Depletion Potential (ODP)	kg-CFC11 eq	1.09E-06	6.23E-08	9.96E-07	2.14E-06	TRACI 2.1
Eutrophication Potential (EP)	kg-N eq	1.17E-01	2.19E-02	2.95E-01	4.34E-01	TRACI 2.1
Acidification Potential (AP)	kg-SO2 eq	1.32E+00	2.34E-01	1.28E+00	2.83E+00	TRACI 2.1
Photochemical Oxidant Creation Potential (POCP)	kg C2H4 eq	6.94E-02	8.16E-03	6.93E-02	1.47E-01	CML-IA Baseline V3.10
Smog Formation (Potential)	kg O3 eq	1.38E+01	5.51E+00	2.09E+01	4.02E+01	TRACI 2.1
Abiotic Resource Depletion Potential of Non-renewable (Fossil) Energy Resourses (ADPfossil)	MJ, LHV	2.47E+03	5.84E+02	7.25E+03	1.03E+04	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, G Steel 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]	2.47E+03	5.84E+02W	9.14E+02	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]	1.09E+03	0.00E+00	0.00E+00	1.09E+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	5.47E-05	5.47E-05
Non-hazardous Waste Disposed	Metric ton	0.00E+00	0.00E+00	1.79E-01	1.79E-01
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	8.18E-02	8.18E-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

CO2 EMISSIONS	UNIT	A1	A2	A3
CO2 Emission from Calcination	t-CO2/metric ton	4.64E+00	0.00E+00	0.00E+00

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

Consumption of Freshwater

FRESHWATER	UNIT	A1	A2	A3
Water Consumption	M3/metric ton	0.00E+00	0.00E+00	1.40E+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 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 hot rolled coil 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 these pollutants make transportation a significant contributor to environmental impacts, particularly in terms of Smog contribution

Regarding Global Warming Potential, which has a significant environmental impact, A1 contributes 30%, A2 contributes 5%, and A3 contributes 65%. Since A3 has the greatest contribution to this factor, a sensitivity analysis has been conducted for Global Warming Potential.

Sensitivity analysis

The analysis results show that module A3 has the highest environmental impact, comprising 57.50% electricity consumption and 7.14% natural gas consumption. These two factors contribute to more than 99% of the impact of module A3, indicating that the majority of the environmental impact in steel production arises from energy usage.

Electricity is the greatest factor of environmental impact. To assess the impact of the GHG emission factor of electricity on these results, a sensitivity analysis was conducted to compare impact between different emission factors from different countries, namely Thailand (used in this study, sourced from Ecoinvent v3.10), Japan, and Austria. The results show that substituting Thailand's emission factor with that of Japan,which has a slightly lower carbon intensity electricity grid, results in a modest reduction in the GWP of Module A3 of around 1%. In contrast, 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 56%. These findings highlight the importance of sourcing electricity with a lower GHG emission factor as a key strategy for climate impact mitigation. Additionally, efforts to reduce electricity consumption and enhance energy efficiency remain effective measures for minimizing environmental impacts.

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

TRACI 2.1 V1.07 / US 2008

CML-IA Baseline V3.10

Ecoinvent Ver 3.10 (2023)

G Steel Official Website: https://www.gsteel.com/en/home

Product Information (Steel Grades & Specifications): https://www.gsteel.com/en/our-product/steel-grades-specifications

Certificates (Quality Certifications): https://www.gsteel.com/en/our-product/certificate