Environmental Product Declaration

According to ISO 14025

Hot-rolled Structural Steel Sections

Steel Dynamics, Inc. (SDI) is one of the largest and most diversified domestic steel producers and metals recyclers in the United States, with an estimated steelmaking and coating capacity of approximately 16 million tons, and facilities located throughout the United States and Mexico. SDI operates using a circular manufacturing model, producing lower-carbon-emission, quality steel using electric arc furnace (EAF) technology with recycled ferrous scrap as the primary input. SDI's circular economy is driven by the passion and dedication of its innovative teams at each of its operating platforms: steel, metals recycling, steel fabrication, and aluminum.

The Structural and Rail Division, located in Columbia City, Indiana (SDI Columbia City) manufactures a range of steel products including semi-finished steel, rebar and structural steel, as well as rail products tailored to meet diverse customer requirements across construction and infrastructure sectors.

Steel Dynamics, Inc.® Long Products Group Structural and Rail Division	Issue Date: October 15, 2025
	Valid Until: October 15, 2030

2 General Information

2.1 EPD Holder and General Product Information

EPD holder's name and address:	Steel Dynamics, Inc. Structural and Rail Division 2601 County Road 700 E Columbia City, IN 46725, United States
Product name:	Hot-rolled Structural Steel Sections (Structural Steel)
Description of the product's intended application and use:	Structural steel, including beams, channels, angles, and other profiles, are widely used in both residential and commercial construction, as well as in bridge building and various industrial installations. These products are selected for their high strength-to-weight ratio and durability in load-bearing applications.
Product image:	
EPD Scope:	Cradle-to-Gate
Markets of applicability:	North America
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by: HATCH	Hatch Ltd. 2800 Speakman Drive, Mississauga Ontario, Canada L5K 2R7

2.2 Verification Information

Name of EPD program and program operator name, address, logo and website:		ASTM International 100 Barr Harbor Drive P.O. Box C700, West Conshohocken, PA 19428-2959, USA www.astm.org
Unique declaration number:	EPD 1075	
Version number:	0	
Issue date of declaration:	October 15, 2025	
Validity period of declaration:	5 years	
Core Standard:	ISO 21930:2017	
PCR:	Smart EPD Part A Product Category Rules for Building and Construction Products and Services, version 1.2	
Sub-category PCR:	Smart EPD Part B Product Category Rules for Designated Steel Construction Products, version 3	
Sub-category PCR review conducted by:	Dr. Thomas Gloria (chair) Industrial Ecology Consulting t.gloria@industrial-ecology.com	
	Robert Wills Wills Marketing Service robertwills.steel@gmail.com	
	Joseph Anderson Independent Consultant jga323@gmail.com	
Program Operator General Program Instructions	ASTM. (2020). General Program Instructions, Version: 8.0. ASTM Program Operator for Product Category Rules (PCR) and Environmental Product Declarations (EPDs).	
Independent Verification of the declaration and data, according to ISO 21930 and ISO 14025:2006:	☐ INTERNAL ☒ EXTERNAL	

LCA Project Report Third party verifier	Dr. Thomas Gloria (chair) Industrial Ecology Consulting t.gloria@industrial-ecology.com	
EPD Generator Tool, if relevant	Simapro 10.2.0.0	
EPD Third party verifier:	Dr. Thomas Gloria (chair) Industrial Ecology Consulting t.gloria@industrial-ecology.com	
Further explanatory materials may be obtained from:	Steel Dynamics, Inc. Structural and Rail Division 2601 County Road 700 E Columbia City, IN 46725, United States	

DISCLAIMER:

This Report is meant to be read as a whole, and sections should not be read or relied upon out of context. The Report incorporates information provided by third parties. This includes information relating to inputs, feed types, and quality, production characteristics and/or outputs related to the products for which an Environmental Product Declaration ("EPD") has been prepared. Hatch has relied upon the accuracy and quality of this information to perform its assessment. Unless specifically stated otherwise, Hatch has not verified the information and disclaims any responsibility or liability in connection with same.

While this Report assesses the anticipated environmental impact of certain identified products, actual impacts can be affected by a variety of factors, some of which may occur after the effective date of this report, or which may not have been known or reasonably ascertainable by Hatch at the time of drafting. The PCR requires the reporting of a limited set of LCA metrics, allowing for the possibility that relevant environmental impacts may exist beyond those disclosed by this EPD. The EPD does not indicate that any environmental or social performance benchmarks are met, nor are thresholds exceeded.

This EPD has been developed in accordance with the PCR applicable for the identified product following the principles, requirements and guidelines of the ISO 14040, ISO 14044, ISO 14025, and ISO 21930 standards. The results in this EPD Report are estimations of potential impacts. The quality of the information, conclusions, estimates, and projections found in the Report are consistent with its specified level of accuracy and the circumstances under which it was prepared. The accuracy of results in different EPDs may vary as a result of background data assumptions and quality of data collected. This Report contains the professional opinion of Hatch based upon information available at the time of its preparation and for the production period identified herein.

The environmental impact results of products in this document are based on a declared unit and therefore do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the product impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted.

EPDs are only comparable if they conform with ISO 21930, this sub-category PCR, include all relevant information modules and are based on equivalent scenarios with respect to the construction works context.

2.3 Limitations, Liability, and Ownership

The EPD owner has sole ownership, liability, and responsibility for the EPD.

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building or construction works level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible 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 in results upstream or downstream of the life cycle stages declared.

The environmental impact results of products in this document are based on a declared unit and therefore do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the product impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted

A manufacturer shall not make claims based on an industry-average EPD which leads the market to believe the industry-average is representative of manufacturer-specific or product-specific results.

It is recognized that by following the typical ISO 21930:2017 definitions of module A1, A2 and A3 for a specific production facility, inconsistencies will occur in classifying individual processes as either A1 or A3 based on the scope of the operations that take place at a given facility. Care must be taken not to compare A1, A2 or A3 on an individual basis for a given product from various mill producers, but, instead on the aggregated total of A1, A2 and A3. Separate A1, A2 and A3 values are provided for a better understanding of the processes taking place at a given facility and a greater level of transparency.

Construction product environmental impact results provide a sufficient basis for comparison only when considered in the context of the construction works project. In all cases of comparing construction products, the principle that the basis for comparison of the assessment is the construction works level shall be maintained by ensuring that the same functional requirements are met and the criteria in ISO 21930:2017 Section 5.5 "Comparability of EPDs for construction products" are satisfied.

The reported fabricated product results are based on industry-average fabrication impacts. Actual impacts for fabricated products vary depending on the particular project and its fabrication demands.

3 Product Information and Methodological Framework

3.1 Declared or Functional Unit

The declared unit for this study is one (1) metric ton (1,000 kg) of structural steel, at the factory gate.

Due to the cradle-to-mill-gate scope of this assessment and the variability in downstream applications of the product, this EPD uses a declared unit rather than a functional unit. As the use phase is outside the study boundary, a reference service life (RSL) is not applicable and has therefore been excluded.

3.2 Product Specifications

SDI Columbia City manufactures a diverse portfolio of steel products. These products are engineered to meet stringent industry standards and are tailored for diverse structural and infrastructure applications.

The boundary option, form factor, steel type, and additional options as detailed in Table 3-1.

Table 3-1: Steel Product Specification

Label	Option		
System boundary option	1. Mill Product		
Form factor	Hot Rolled Sections (Structural)		
Production route representation	**Route**	**Is Represented**	**Percentage of representation**
	BOF	FALSE	-
	EAF	TRUE	100%
	OHF	FALSE	-
	Unknown	FALSE	-
Steel type	Carbon/Alloy		

3.3 Product Material and Component Information

SDI Columbia City's steel products use EAF and ladle metallurgy furnace (LMF) technology. The steel products are manufactured using ferrous scrap with small percentages of alloying elements and ancillary materials (e.g. charge and injection carbon) added, as presented in Table 3-2. Material composition varies based on customer specifications.

Table 3-2. Material Composition

Impact	Structural Steel
Recycling Content	98%
Alloying Materials	2%

This product contains only negligible amounts of biogenic carbon, and its production does not rely on biomass or bio-based fuels. Consequently, the reporting of biogenic carbon emissions and removals, as required by the applicable PCR, is not applicable to this EPD. Furthermore, the manufacturing and processing activities at SDI Columbia City do not involve calcination or carbonation reactions, and therefore such emissions are not reported.

The products, when used as intended, do not contain any hazardous wastes according to the Resource Conservation and Recovery Act, Subtitle 3C. The products, when used as intended, do not release dangerous substances to the environment, including indoor air emissions, gamma or ionizing radiation, or chemicals released to air or leached to water and soil.

3.4 EPD Representativeness

3.4.1 Scope of the EPD

The scope of this EPD is limited to the cradle-to-gate stages (A1– A3) system boundary, as depicted in Table 3-3 and Figure 3-1. Construction Process (Modules A4-A5), End-of-Life (Modules C1-C4), and Benefits/Loads beyond the system boundaries (Module D) are excluded from the system boundary.

Table 3-3: Life Cycle Stages Included in the System Boundary

Product			Construction Process		Use							End-of-Life				Benefits/Loads beyond the system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse, recycling and/or energy recovery
✓	✓	✓	X	X	X	X	X	X	X	X	X	X	X	X	X	X

✓ = Module included. X = Module not declared.

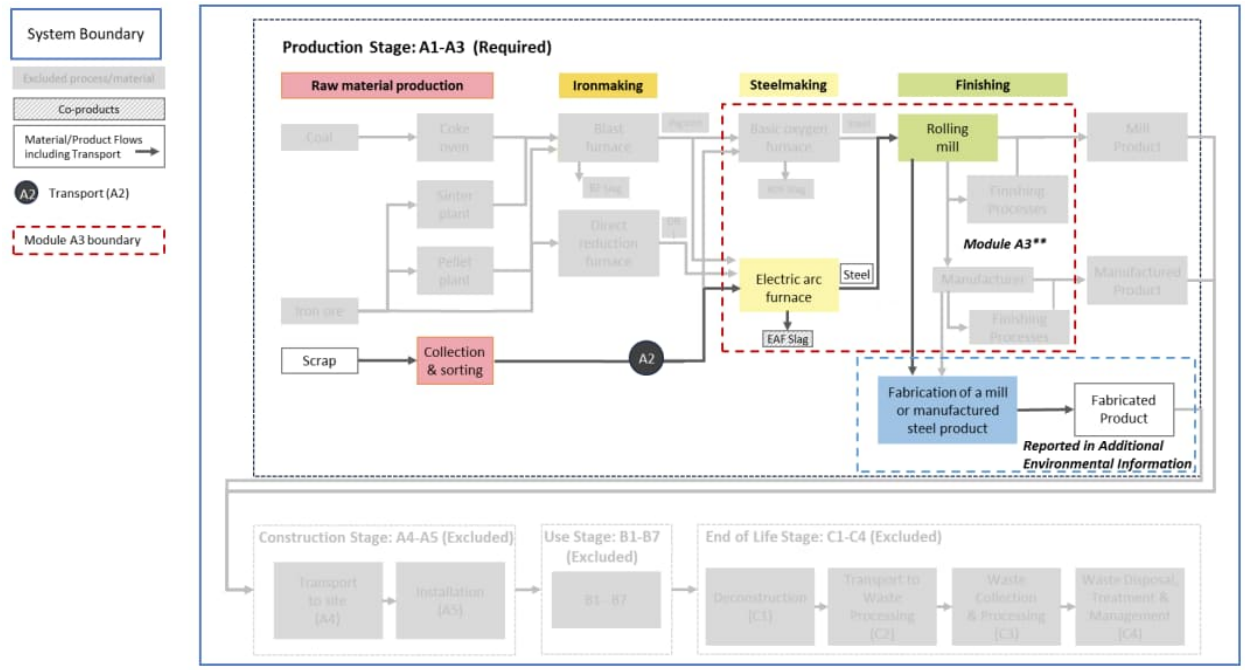

Figure 3-1. Steel System Boundary Diagram [R-2]

3.4.2 EPD Data Specificity

This EPD is both facility- and product-specific, capturing the distinct operational characteristics of the site and the individual product lines. The percentage of supply-chain specificity for each unit process, calculated in accordance with the ACLCA PCR Guidance Addendum [R-8], is presented in Table 3-4. As a result, the overall product-level supply-chain specificity metric for Global Warming Potential (GWP-SCS_{A1-A3}), also known as percent primary data was determined to be 75%, reflecting the proportion of supply chain data that is specific rather than generic.

Table 3-4. Determination of Supply-Chain-Specificity for Each Unit Process

Module	Unit Processes	Specificity Score	Justification
A1	Upstream Materials	0%	Although material quantities are based on primary data, the LCI data used is generic and lacks supply-chain specificity.
A2	Transportation	100%	Transportation modes (e.g., truck, ship, plane) are clearly identified for each segment. Distances are measured from supplier to facility, and mode-specific LCI datasets are used, meeting specificity requirements.
A3	Electricity	100%	Electricity consumption is based on primary data. Background LCI data is regionally representative, current (within three years), and includes Renewable Energy Certificates (RECs) compliant with ACLCA guidance.
A3	Fossil Fuel		
	Natural Gas	100%	Country-level background data qualifies as supply-chain-specific.
	Diesel	100%	Country-level background data qualifies as supply-chain-specific.
	Gasoline	0%	Background data lacks country-level specificity and does not meet supply-chain criteria.
	Propane	0%	Background data lacks country-level specificity and does not meet supply-chain criteria.
A3	Process Emissions	100%	Emissions data is derived from primary sources, ensuring full specificity.
A3	Other Materials	0%	Background data lacks country-level specificity and does not meet supply-chain criteria.

3.5 Manufacturing Information

At the SDI Columbia City facility, structural steel is manufactured using EAF technology. The EAF is charged with a combination of externally sourced post-consumer and post-industrial steel scrap, and internally recycled scrap material. Electrical energy is utilized to melt the charge, while lime additives are introduced to promote slag formation, enabling the removal of impurities.

Molten steel is transferred to an LMF, where the steel undergoes secondary metallurgical treatment, including desulfurization, deoxidation, and alloy composition adjustments. Temperature regulation is maintained through the use of carbon electrodes.

The refined molten steel is then subjected to vacuum degassing to remove dissolved gases such as hydrogen and nitrogen. The steel is then continuously cast into solid forms, which are cut to specified lengths to produce semi-finished steel products.

Structural steel is reheated and processed through a Breakdown Mill and Tandem Mill (Heavy Section Mill) to achieve target thickness, or through a Continuous Mill (Medium Section Mill) for dimensional reduction. The output is straightened and cut to customer-specified lengths. Structural products are packed and shipped directly to consumers.

SDI Columbia City process flow diagram is illustrated in Figure 3-2.

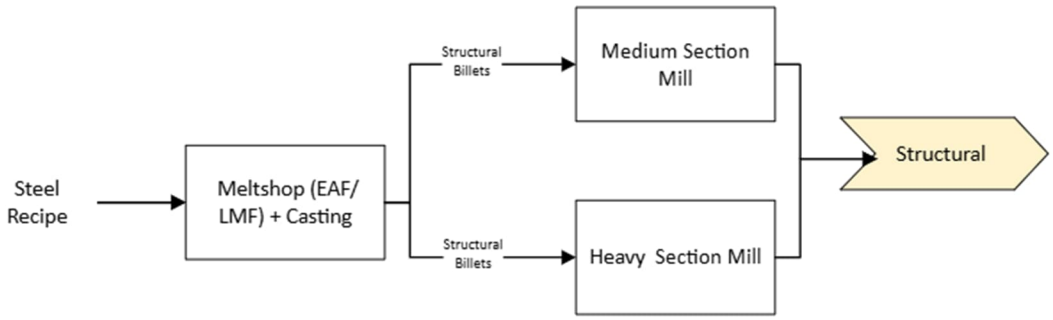

Figure 3-2: Process Flow Diagram

3.6 Software, Data Sources, And Data Quality

3.6.1 Software and Databases

The life cycle assessment (LCA) model was developed using SimaPro version 10.2.0.0. Primary data reflecting the 2023 production year was obtained directly from operations at the SDI Columbia City facility. This data encompasses raw and secondary materials, transportation, ancillary inputs, packaging, electricity, fuels, water usage, waste management, and emissions to air and water. While electricity consumption figures are based on 2023 calendar year data, the application of Renewable Energy Certificates (RECs) corresponds to 2024, with the rationale for this approach detailed in Section 3.8.

Secondary data related to the upstream extraction and production of raw materials was obtained from the following life cycle inventory databases: Ecoinvent v3.11 (2025), USLCI+ (2024), and US-EI2.2 v2023.1 (2023).

3.6.2 Data Sources

Foreground data and background LCI dataset information is documented in Appendix A.

3.6.3 Data Quality

Data quality is presented in Table 3-5, based on its representativeness (technology coverage, geographic coverage, time coverage), as well as completeness, consistency, reproducibility, transparency, and uncertainty.

Table 3-5: Data Quality Assessment

Data Quality	Description
Technology coverage	The primary data accurately reflects the actual technologies currently in use at SDI Columbia City. The technological representativeness is rated as medium to high.
Geographic coverage	U.S.-specific datasets were used wherever available. In cases where such data was not accessible, datasets representing Rest of World (RoW) or Global (GLO) averages were applied. As a result, the geographic representativeness of the data is assessed as medium.
Time Coverage	Primary data reflects operations from the 2023 calendar year, with electricity data sourced from 2024 calendar year, assuming no significant changes in operational processes (see Section 5.6.1). Background data was drawn from the Ecoinvent USLCI+ and US-EI2.2 databases. The temporal representativeness is rated as high.
Precision	While statistical variance was not quantified, the use of primary data for manufacturing processes supports a high level of precision.
Completeness	All identifiable material and energy flows into and out of SDI Columbia City were included in the LCA model. Mass balance checks and industry benchmarking were conducted to identify and resolve data gaps, with direct input from SDI Columbia City where necessary.
Consistency	The methodology conforms to relevant ISO standards and PCRs, and was applied uniformly across all analytical components. Only data of comparable granularity and quality were used. A consistent LCI modeling framework and allocation approach were maintained throughout.
Reproducibility	All datasets, assumptions, and allocation procedures are documented in the full LCA project report, ensuring the study is reproducible.
Transparency	The study demonstrates a high degree of transparency. Key unit processes are detailed in Section 4.4, and the complete LCI datasets are provided in Appendix A, supporting both internal and external review.
Uncertainty	A sensitivity analysis was performed to assess the impact of assumptions related to slag allocation. The results are presented in Section 4.3.3.

3.7 LCA Discussion

3.7.1 Allocation Procedure

For inputs and outputs reported on a facility-wide basis, allocation to individual unit processes was performed using a mass-based approach. This method ensures proportional distribution of shared resources and emissions across all relevant production stages.

Steel slag is recognized as a co-product within a joint production system involving steel manufacturing. The life cycle inventory (LCI) for this process is allocated between the primary output (steel) and the co-product (slag) using a physical partitioning approach. Each input and output flow is proportionally assigned to steel and slag based on its functional role in their formation, ensuring a physically consistent allocation of environmental impacts [R-9].

Waste and secondary material handling processes at the SDI Columbia City facility are allocated in accordance with the "polluter pays" principle. Under this approach, the environmental impacts associated with waste management are assigned to the facility responsible for generating the waste [R-3].

3.7.1 Cut-Off Procedure

The cut-off criterion applied in this study is consistent with the requirements outlined in the Smart EPD PCR Part A [R-1] and ISO 21930 [R-3]. Inputs and outputs associated with each unit process within the defined system boundary have been systematically collected and incorporated into the assessment. The

study accounts for all known material and energy flows; consequently, no known flows have been intentionally excluded from the inventory.

3.8 Renewable Electricity

In 2023, the SDI Columbia City facility allocated and retired a total of 144,793 MWh of renewable energy certificates (RECs), with the energy mix comprising 60% wind and 40% solar generation. In 2024, the facility significantly increased its REC retirement to 297,209 MWh, all sourced from wind energy. The increase was due to SDI's Virtual Power Purchase Agreement (VPPA) with NextEra Energy coming online in January 2024. That quantity of RECs will be sustained during the life of this LCA due to the contract term of 15 years and therefore, 2024 RECs were used in this LCA. RECs allocated to SDI Columbia City have not been and will not be sold or transferred after a claim has been made.

Although the data collected for this assessment reflects production activities at the SDI Columbia City facility during the 2023 calendar year, the electricity data has been updated to represent conditions for the 2024 calendar year. This adjustment is considered appropriate because there have been no significant changes to the facility's operational processes or major consumables that would materially affect electricity usage.

The life cycle assessment (LCA) and life cycle inventory (LCI) results incorporating RECs were calculated in accordance with the 2022 guidance from the American Center for Life Cycle Assessment on quantifying renewable electricity instruments in Environmental Product Declarations [R-10]. The technical scenario for RECs is presented in Table 3-6.

Table 3-6: Technical Scenario

Parameter	2024 Value
Electricity source Onsite or offsite	Offsite
Renewable energy type(s)	Wind
Percent of EPD Owner's product-related electricity covered	26%
If <100%, grid type used to model remaining electricity	Residual Mix from PJM
Electricity accounting methodology	Market-based
Commitment pledged for entire validity period of EPDs	Yes

4 Environmental Information From LCA

This section summarizes the potential cradle-to-gate environmental impact and inventory indicator results. All results are presented per 1 metric tonne of hot-rolled structural steel sections delivered at the factory gate (excluding fabrication), applicable to each of the four product categories under evaluation.

Life cycle impact assessment (LCIA) characterization factors for all impact categories, except Global Warming Potential (GWP), are based on the U.S. EPA's TRACI v2.2 method for FEDEFLv1. GWP is assessed using the Environmental Footprint (EF) method, version 3.1. The quantification of renewable and non-renewable primary energy resources used as energy carriers was performed using the Cumulative Energy Demand (CED, LHV) Version 1.01 method. All other life cycle inventory (LCI)

indicators were calculated in accordance with the methodological guidance outlined in the ACLCA Guidance to calculating non-LCIA inventory metrics [R-7],

The LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks [R-1].

Results that are not declared are reported as “indicator not declared” with the acronym “IND”.

4.1 Results from LCIA

This section presents the LCIA results, according to the applicable PCR. Table 4-1 summarize the LCIA results for hot-rolled structural steel sections.

Table 4-1. LCIA Results – 1 Tonne of Hot-rolled structural steel sections

Indicators	Unit	A1	A2	A3	A1-A3
GWP - Total	$kgCO_2e$	9.67E+01	2.67E+01	5.41E+02	6.64E+02
GWP - Fossil	$kgCO_2e$	9.64E+01	2.67E+01	5.41E+02	6.64E+02
GWP - Biogenic	$kgCO_2e$	1.44E-01	0.00E+00	9.74E-02	2.41E-01
GWP - LULUC	$kgCO_2e$	1.06E-01	0.00E+00	2.60E-02	1.32E-01
ODP	kgCFC-11e	6.15E-07	2.28E-08	2.72E-06	3.36E-06
AP	$kgSO_2e$	6.19E-01	3.39E-01	8.22E-01	1.78E+00
EP - Marine	kgNe	9.74E-02	8.44E-02	1.11E-01	2.93E-01
EP - Freshwater	kgPe	2.65E-02	1.67E-05	3.62E-02	6.27E-02
SFP	kgO_3e	1.13E+01	1.02E+01	1.24E+01	3.39E+01

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building or construction works has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase only when product or construction works 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 or EN 15804. 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 comparisons can be inaccurate and could lead to erroneous selection of materials or products that are higher-impact, at least in some impact categories [R-1].

4.2 Results from LCI

This section presents the LCI results for resource use and output flows and waste categories, according to the applicable PCR. The corresponding LCI results for resource use are presented in Table 4-2. The corresponding LCI results for Output Flows and Waste Categories are presented in Table 4-3.

Table 4-2. Resource Use – 1 Tonne of Hot-rolled structural steel sections

Indicators	Unit	A1	A2	A3	A1-A3
RPRE	MJ LHV	1.94E+02	5.56E-04	6.92E+02	8.86E+02
RPRM	MJ LHV	IND	IND	IND	IND
RPRT	MJ LHV	1.94E+02	5.56E-04	6.92E+02	8.86E+02
NRPRE	MJ LHV	1.08E+03	1.84E+02	7.92E+03	9.19E+03
NRPRM	MJ LHV	IND	IND	IND	IND
NRPRT	MJ LHV	1.08E+03	1.84E+02	7.92E+03	9.19E+03
SM	kg	0.00E+00	0.00E+00	1.03E+03	1.03E+03
RSF	MJ LHV	IND	IND	IND	IND
NRSF	MJ LHV	IND	IND	IND	IND
RE	MJ LHV	IND	IND	IND	IND
ADP_{fossil}	MJ	9.97E+02	1.83E+02	6.31E+03	7.49E+03
FW	m^3	3.76E-01	1.35E-02	1.94E+00	2.33E+00

Table 4-3. Output Flows and Waste Categories – 1 Tonne of Hot-rolled structural steel sections

Indicators	Unit	A1	A2	A3	A1-A3
HWD	kg	0.00E+00	0.00E+00	6.09E+00	6.09E+00
NHWD	kg	0.00E+00	0.00E+00	1.75E+01	1.75E+01
HLRW	m^3	IND	IND	IND	IND
ILLRW	m^3	IND	IND	IND	IND
CRU	kg	IND	IND	IND	IND
MR	kg	0.00E+00	0.00E+00	1.90E+02	1.90E+02
MER	kg	IND	IND	IND	IND
EE	MJ LHV	IND	IND	IND	IND

4.3 Interpretation

4.3.1 Contribution Analysis

Figure 4-1 represents the impact assessment by module for 1 tonne of hot-rolled structural steel sections, on a percentage (%) basis.

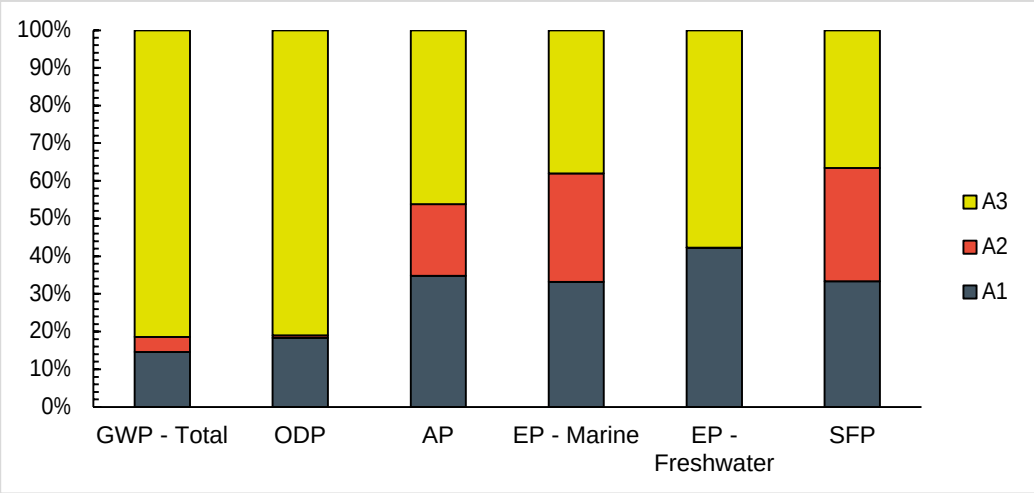

Figure 4-1: Contribution Analysis – 1 Tonne of Hot-rolled structural steel sections

4.3.2 Dominance Analysis

A dominance analysis was performed for the GWP impact category to determine the most significant contributors to the overall environmental impact . This analysis focused exclusively on the GWP category, as it represents the primary area of interest for SDI Columbia City. The results of this assessment are summarized in Table 4-4.

Table 4-4: Processes with Significant Impact on GWP (% Contribution)

Inputs and Outputs	Hot-rolled structural steel sections
Purchased Scrap	3%
Alloying Elements Production[1]	12%
Electricity Production and Transmission	33%
Chemical Production	2%
Lime Production	7%
Natural Gas Production	4%
Direct Air Emissions[2]	34%
Upstream Transportation	4%
Others (≤1% Individual Contribution)	1%

1. The Alloying Elements Production category includes materials such as aluminum, ferrochrome, ferromanganese, and silicon manganese. Despite their low mass contribution, these materials are highly energy-intensive and significantly impact the overall GWP.
2. Direct air emissions encompass combustion-related emissions from fuels (natural gas, propane, gasoline, and diesel) as well as process emissions from carbon-based materials and non-combustion sources within meltshop and casting operations.

4.3.3 Slag Allocation

To evaluate the sensitivity of the results to the chosen allocation method, an alternative scenario was assessed in which the entire environmental burden is attributed solely to the steel product, with slag receiving no allocation. This sensitivity analysis was conducted to determine the extent to which impact assessment results might vary under this assumption. The results of this sensitivity analysis are presented in Table 4-5.

Table 4-5: Sensitivity Analysis - Slag Allocation

Indicator	Hot-rolled structural steel sections
GWP - Total	6.2%
GWP - Fossil	6.2%
GWP - Biogenic	5.3%
GWP - LULUC	2.6%
ODP	5.6%
AP	4.9%
EP - Marine	3.5%
EP - Freshwater	6.8%
SFP	3.2%
ADP_{fossil}	6.9%

5 Additional Environmental Information

5.1 Description of Organization

SDI Columbia City operates as a division of SDI, a leading steel producer and metals recycler in the United States. SDI is one of the most diversified domestic steel manufacturers in the United States, with an estimated annual steelmaking and coating capacity of approximately 16 million tons. The company operates a network of facilities across the United States and Mexico.

SDI employs a circular manufacturing model that emphasizes environmental sustainability by utilizing EAF technology. This process relies on recycled ferrous scrap as the primary raw material, enabling the production of high-quality steel with lower-carbon emissions. The company's circular economy is structured around its operational platforms: steel production, metals recycling, steel fabrication, and aluminum.

Since its establishment, SDI has maintained a strong commitment to environmentally responsible operations. Its metals recycling affiliate collects and processes scrap materials derived from manufacturing and end-of-life products such as vehicles, appliances, and industrial equipment. The processed scrap is marketed to various end users, including SDI's own EAF steel mills, where it is reintroduced into the production cycle. In 2024, the average steel recycled content across our steel mills was approximately 87%.

The steel produced is supplied to external customers for further processing and to SDI's internal manufacturing affiliates, which fabricate finished products for end-use markets. These products, upon reaching the end of their service life, can be recycled and reintegrated into SDI's production system, thereby reinforcing the company's closed-loop manufacturing model.

At the Columbia City facility, SDI manufactures a range of semi-finished and structural steel products, including parallel flange beams, H-piles, channel sections, flat bars, and large unequal leg angles. The facility also produces various types of reinforcing bars—custom cut-to-length, smooth, and coiled—as well as standard carbon, intermediate alloy, and premium-grade rails ranging from 40 to 320 feet in length for the railroad industry. Notably, SDI Columbia City's premium rail products are certified by all Class I railroads. Additionally, the facility includes a rail welding operation capable of producing continuous welded rail segments up to 1,650 feet in length.

5.2 Environment and Health During Manufacturing

SDI is committed to providing safe and healthy working conditions for the prevention of work-related injuries and illness; protecting the environment and conserving natural resources; and contributing positively to the communities in which we operate by acting with integrity and fulfilling our compliance obligations. We strive to incorporate sound environmental, health & safety practices into our daily decisions.

In support of our environmental, health & safety policy and mission statement, we are committed to continually improve our environmental, health & safety management and performance by:

- Integrating our core values, strategic focus, and environmental, health & safety management objectives and initiatives.
- Fulfilling our environmental, health & safety compliance obligations by meeting all applicable local, state, and federal regulations, customer requirements, and corporate governance.
- Demonstrating proper safety and environmental behavior through personal example.
- Maintaining open, two-way consultation and participation when addressing environmental, health & safety issues and goals.
- Driving continuous improvement initiatives to eliminate safety hazards and to reduce environmental, health & safety risks.
- Promptly reporting all safety and environmental areas for improvement.
- Identifying opportunities for environmental sustainability by emphasizing responsible use of energy including the adoption of innovative practices to encourage energy conservation and improve energy efficiency.
- Communicating and fostering the use of environmental, health & safety best practices.
- Actively participating in the environmental, health & safety community and taking prominent roles within our industry to set the standard for environmental stewardship and safe working conditions.

5.3 Environmental Activities and Certifications

SDI Columbia City is ISO 9001 accredited.

5.4 Non-Adjusted Baseline Results

In accordance with PCCR guidance, when RECs are incorporated into the primary results, it is necessary to also present the non-adjusted baseline results to maintain clarity and comparability. These results are summarized in Table 5-1 to Table 5-3

Table 5-1. LCIA Results Without RECs– 1 Tonne of Hot-Rolled Structural Steel Sections

Indicators	Unit	A1-A3
GWP - Total	$kgCO_2e$	7.42E+02
GWP - Fossil	$kgCO_2e$	7.42E+02
GWP - Biogenic	$kgCO_2e$	2.47E-01
GWP - LULUC	$kgCO_2e$	1.34E-01
ODP	kgCFC-11e	3.65E-06
AP	$kgSO_2e$	1.94E+00
EP - Marine	kgNe	3.09E-01
EP - Freshwater	kgPe	7.15E-02
SFP	kgO_3e	3.56E+01

Table 5-2. Resource Use Without RECs – 1 Tonne of Hot-Rolled Structural Steel Sections

Indicators	Unit	A1-A3
RPRE	MJ LHV	2.28E+02
RPRM	MJ LHV	IND
RPRT	MJ LHV	2.28E+02
NRPRE	MJ LHV	1.08E+04
NRPRM	MJ LHV	IND
NRPRT	MJ LHV	1.08E+04
SM	kg	1.03E+03
RSF	MJ LHV	IND
NRSF	MJ LHV	IND
RE	MJ LHV	IND
ADP_{fossil}	MJ	8.52E+03
FW	m^3	2.59E+00

Table 5-3. Output Flows and Waste Categories Without RECs – 1 Tonne of Hot-Rolled Structural Steel Sections

Indicators	Unit	A1-A3
HWD	kg	6.09E+00
NHWD	kg	1.75E+01
HLRW	m^3	IND
ILLRW	m^3	IND
CRU	kg	IND
MR	kg	1.90E+02
MER	kg	IND
EE	MJ LHV	IND

5.5 Impacts Associated with Fabrication

The following table contains results related to fabrication that are not part of the underlying LCA, LCI and additional module-based data for this product. Fabrication impacts are based on published industry-averages available at the time of the publication of this EPD [R-11]. To calculate the fabricated results, the following assumptions were made:

- Module A1: Includes the environmental impacts from raw material supply adjusted for material overages (1.0771 tonnes of structural steel).
- A2 Module: Covers transportation impacts from the steel mill to the fabrication facility, as reported by the American Institute of Steel Construction (AISC) for structural steel [R-11].
- A3 Module: Represents the environmental impacts of the fabrication process, as reported by the American Institute of Steel Construction (AISC) for structural steel [R-11].

This LCA estimates eutrophication impacts from steel fabrication using industry-average data and TRACI 2.1 factors. Based on discharge patterns, 90% of the impact is attributed to freshwater and 10% to marine environments. Marine impacts are reported in kg N-eq, while freshwater impacts are converted using the Redfield ratio (1 kg P = 7.23 kg N-eq), resulting in freshwater values expressed as 0.12 of the TRACI 2.1 results in kg P-eq.

The quantified results for fabricated structural steel products are summarized in Table 5-4.

Table 5-4: Impact Assessment Indicators – 1 Tonne of Tonne of Fabricated Structural Steel

Indicator	Unit	A1	A2	A3	A1-A3
GWP - Total	kg CO2 eq	7.15E+02	4.46E+01	9.67E+01	8.57E+02
ODP	kg CFC-11 eq	3.62E-06	8.67E-14	1.63E-09	3.62E-06
AP	kg SO2 eq	1.92E+00	1.83E-01	1.52E-01	2.25E+00
EP - Marine	kg N eq	3.16E-01	1.64E-03	1.23E-03	3.19E-01
EP - Freshwater	kg P eq	6.76E-02	1.97E-03	1.48E-03	7.10E-02
SFP	kg O3 eq	3.65E+01	4.44E+00	2.23E+00	4.32E+01
ADP_{fossil}	MJ	8.07E+03	7.16E+01	1.04E+02	8.24E+03

6 REFERENCES

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[R-11] American Institute of Steel Construction (AISC). (2021). EPD Background Report: Fabricated Hot-Rolled Sections, Plates, and Hollow Structural Sections. Retrieve from AISC EPD background report_2021_with HSS_1101.pdf - Google Drive

Appendix A:
Data Disclosure

Input/Output	Module	LCI Datasets	Geographic Region	Year Dataset Represents	Reference
Scrap Material					
Scrap Material	A1	Iron scrap, sorted, pressed {RoW}| sorting and pressing of iron scrap | Cut-off, U	RoW	2025	Ecoinvent
Alloying Elements					
Aluminum	A1	Aluminum, primary, ingot, at plant {RNA} | Aluminum, primary ingot, at plant	RNA	2024	USLCI+
Boron Wire	A1	Boron, at factory/US U	US	2023	US-EI 2.2
Calcium injection wire	A1	Calcium carbonate, precipitated {RoW}| calcium carbonate production, precipitated | Cut-off, U	RoW	2025	Ecoinvent
C Alloy (anthracite)	A1	Hard coal {RNA}| hard coal mine operation and hard coal preparation | Cut-off, U	RNA	2025	Ecoinvent
Copper	A1	Copper-rich materials {GLO}| copper, anode to generic market for copper-rich materials | Cut-off, U	GLO	2025	Ecoinvent
Ferrochrome	A1	Ferrochromium, high-carbon, 55% Cr {RoW}| ferrochromium production, high-carbon, 55% Cr | Cut-off, U	RoW	2025	Ecoinvent
Ferrocolumbium	A1	Ferroniobium, 66% Nb {RoW}| ferroniobium production, from pyrochlore concentrate, 66% Nb | Cut-off, S	RoW	2025	Ecoinvent
Ferromanganese	A1	Ferromanganese, high-coal, 74.5% Mn {RoW}| ferromanganese production, high-coal, 74.5% Mn | Cut-off, U	RoW	2025	Ecoinvent
Ferrosilicon	A1	Ferrosilicon {RoW}| ferrosilicon production | Cut-off, U	RoW	2025	Ecoinvent
Fluorspar	A1	Fluorspar, 97% purity {GLO}| fluorspar production, 97% purity | Cut-off, U	RoW	2025	Ecoinvent
Molybdenum	A1	Molybdenum {RoW}| molybdenum production | Cut-off, U	RoW	2025	Ecoinvent
Nickel	A1	Nickel, class 1 {GLO}| smelting and refining of nickel concentrate, 16% Ni | Cut-off, U	GLO	2025	Ecoinvent
NitroVan 16	A1	Chemical, inorganic {GLO}| chemical production, inorganic | Cut-off, U	GLO	2025	Ecoinvent
Silicon Manganese	A1	Ferromanganese, high-coal, 74.5% Mn {RoW}| ferromanganese production, high-coal, 74.5% Mn | Cut-off, U	RoW	2025	Ecoinvent
Titanium Wire	A1	Titanium {GLO}| titanium production | Cut-off, U	GLO	2025	Ecoinvent
Ferrovanadium	A1	Ferronickel {GLO}| ferronickel production | Cut-off, U	GLO	2025	Ecoinvent
S wire	A1	Sulfur {RoW}| sulfur production, petroleum refinery operation | Cut-off, U	RoW	2025	Ecoinvent

Input/Output	Module	LCI Datasets	Geographic Region	Year Dataset Represents	Reference
Other Inputs					
Samplers	A3	Corrugated board, mixed fibre, single wall, at plant/US- US-EI U	RNA	2023	US-EI 2.2
Carbon	A3	Hard coal {RNA}| hard coal mine operation and hard coal preparation | Cut-off, U	RNA	2025	Ecoinvent
Sand	A3	Silica sand {RoW}| silica sand production | Cut-off, U	RoW	2025	Ecoinvent
Refractory Materials	A3	Refractory, fireclay, packed {RoW}| refractory production, fireclay, packed | Cut-off, U	RoW	2025	Ecoinvent
Refractory Materials	A3	Refractory, high aluminium oxide, packed {RoW}| refractory production, high aluminium oxide, packed | Cut-off, U	RoW	2025	Ecoinvent
Electrodes	A3	Graphite {RoW}| graphite production | Cut-off, U	RoW	2025	Ecoinvent
Lime Materials	A3	Quicklime, milled, loose {RoW}| quicklime production, milled, loose | Cut-off, U	RoW	2025	Ecoinvent
Acetylene	A3	Acetylene {RoW}| acetylene production | Cut-off, U	RoW	2025	Ecoinvent
Hydrochloric Acid	A3	Hydrochloric acid, at plant, kg {RNA} | Hydrochloric acid, HCl, MDI coproduct, at plant, 100% HCl	RNA	2025	Ecoinvent
Miscellaneous Chemicals	A3	Chemical, inorganic {GLO}| chemical production, inorganic | Cut-off, U	GLO	2025	Ecoinvent
Lubricating Oils	A3	Lubricating oil {RoW}| lubricating oil production | Cut-off, U	RoW	2025	Ecoinvent
Packaging					
Steel Banding	A3	Steel, low-alloyed, hot rolled {GLO}| market for steel, low-alloyed, hot rolled | Cut-off, U	GLO	2025	Ecoinvent
Electricity and Fuels					
Electricity	A3	Electricity, high voltage {US-RFC}| market for electricity, high voltage | Cut-off, U	US	2025	Ecoinvent
Electricity – REC	A3	Electricity, high voltage {US-RFC}| electricity production, wind, 1-3MW turbine, onshore | Cut-off, U	US	2025	Ecoinvent
Natural Gas	A3	Natural gas, high pressure {US}| natural gas, high pressure, domestic supply with seasonal storage | Cut-off, U	US	2025	Ecoinvent
Propane	A3	Propane, burned in building machine {GLO}| propane, burned in building machine | Cut-off, U - Production	GLO	2025	Ecoinvent
Diesel	A3	Diesel, burned in building machine/GLO US-EI U - Production	GLO	2023	US-EI 2.2
Gasoline	A3	Petrol, unleaded, burned in machinery {GLO}| petrol, unleaded, burned in machinery | Cut-off, U - Production	GLO	2025	Ecoinvent

Input/Output	Module	LCI Datasets	Geographic Region	Year Dataset Represents	Reference
Water					
Groundwater	A3	Water, well, US			
Municipal water	A3	Tap water {RoW}| tap water production, conventional treatment | Cut-off, U	RoW	2025	Ecoinvent
Transportation					
Truck Transport	A2	Transport, combination truck, diesel powered {RNA} | Transport, combination truck, diesel powered	RNA	2024	USLCI+
Rail Transport	A2	Transport, train, diesel powered {US} | Transport, train, diesel powered	US	2024	USLCI+
Barge Transport	A2	Transport, ocean freighter, average fuel mix/US	US		USLCI
Wastes					
Non-Hazardous Wastes	A3	Inert waste, for final disposal {RoW}| treatment of inert waste, inert material landfill | Cut-off, U	RoW	2025	Ecoinvent
Hazardous Wastes	A3	Process-specific burdens, residual material landfill/US* US-EI U	US	2023	US-EI 2.2
Emissions to Air					
Natural Gas - Direct Emissions	A3	Heat, district or industrial, natural gas {RoW}| heat production, natural gas, at industrial furnace >100kW | Cut-off, U	RoW	2025	Ecoinvent
Propane - Direct Emissions	A3	Propane, burned in building machine {GLO}| propane, burned in building machine | Cut-off, U - Combustion	GLO	2025	Ecoinvent
Wastewa**ter**					
Water to Municipal Treatment	A3	Wastewater, average {RoW}| market for wastewater, average | Cut-off, U	RoW	2025	Ecoinvent