ENVIRONMENTAL PRODUCT DECLARATION

FABRICATED HOLLOW STRUCTURAL SECTIONS

SEARING INDUSTRIES

Searing Industries was formed in 1985 by the late Richard Searing and is still run by his two sons, Lee and Jim, to this day. Searing Industries produces a wide variety of welded steel tubing products, including mechanical and structural tubing in several shapes and finishes along with structural pipe and pipe piling. Applications for the company's products include agriculture, solar, fitness equipment, racking, fencing, construction, automotive and furniture.

Searing relocated from the Los Angeles area to a much larger facility in Rancho Cucamonga in 1991. Today, the California facility houses five mechanical tube mills, a structural mill, cutting, chamfering and deburring equipment, slitting, laser capabilities and paint lines.

In 2014, Searing opened one of North America's most state-of-the-art tube mills in Cheyenne, Wyoming to extend products and services to distributors and OEMs in the Plains and the Midwest. The 200,000 square foot Wyoming facility includes some of the newest tube mill equipment available in the world.

For more information, please visit: www.searingindustries.com

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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	General Program Instructions v.2.5 March 2020	
ASSOCIATION NAME AND ADDRESS	Searing Industries, 8901 Arrow Route, Rancho Cucamonga, CA 91730	
DECLARATION NUMBER	4790324337.101.1	
DECLARED PRODUCT & DECLARED UNIT	Fabricated hollow structural steel sections, 1 metric ton	
REFERENCE PCR AND VERSION NUMBER	Part A: Calculation Rules for the LCA and Requirements Project Report, (IBU/UL Environment, V3.2, 12.12.2018) and Part B: Designated Steel Construction Product EPD Requirements (UL Environment, V2.0, 08.26.2020).	
DESCRIPTION OF PRODUCT APPLICATION/USE	Fabricated hollow structural steel sections used in construction	
MARKETS OF APPLICABILITY	North America	
DATE OF ISSUE	March 22, 2022	
PERIOD OF VALIDITY	5 years	
EPD TYPE	Product specific	
EPD SCOPE	Cradle to gate	
YEAR(S) OF REPORTED PRIMARY DATA	2019-2020	
LCA SOFTWARE & VERSION NUMBER	GaBi v10	
LCI DATABASE(S) & VERSION NUMBER	GaBi 2021 (CUP 2021.2)	
LCIA METHODOLOGY & VERSION NUMBER	IPCC AR5 + TRACI 2.1	

The sub-category PCR review was conducted by:	UL Environment PCR Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report,", v3.2 (December 2018), in conformance with ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017) ☐ INTERNAL ☒EXTERNAL	Cooper McCollum, UL Environment
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sphera Solutions Inc
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine, Thrive ESG

LIMITATIONS

The environmental impact results of steel 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 steel 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. See the results section for additional EPD comparability guidelines.

Environmental declarations from different programs (ISO 14025) may not be comparable.

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General Information

Description of Organization

This environmental product declaration (EPD) represents hollow structural sections (HSS) produced by Searing Industries in Rancho Cucamonga, CA and Cheyenne, WY.

Product Description

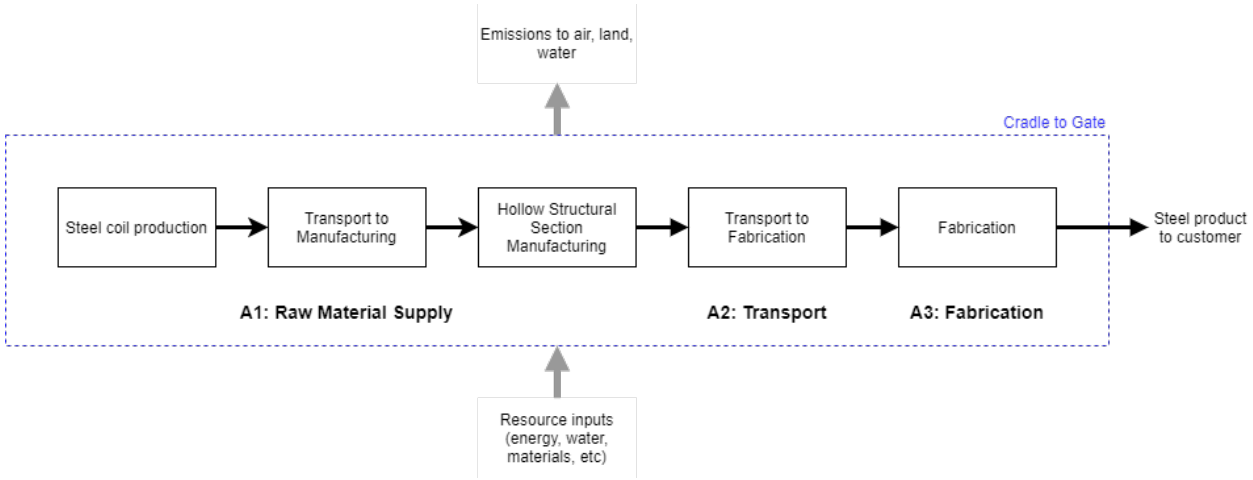
Product Specification

Steel tubes covered under this declaration represent hollow structural sections, structural pipe, pipe piling, ornamental squares and rectangles, and mechanical rounds and speciality ovals. These products are used in agriculture, solar, fitness equipment, racking, fencing, construction, automotive and furniture applications.

Products produced by Searing Industries are defined by the following ASTM standards.

- ASTM A252 | Standard Specification for Welded and Seamless Steel Pipe Piles
- ASTM A500 | Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- ASTM A513 | Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
- ASTM A1085 | Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)

Flow Diagram



Product Average

The 2019 and 2020 production data used in this EPD considers HSS produced by Searing Industries during the year. The products are manufactured in the US. Results are weighted according to production totals at all locations based on the data. Facility-specific global warming potential results are provided in separate tables.

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Application

Searing's products are used in a wide array of construction and manufaturing applications. HSS and pipe piling are often relied upon for the structure of buildings and bridges while mechanical and ornamental tubing are widely used to create OEM products across almost every industry.

Material Composition

Steel HSS products are made of carbon steel with a small percentage of alloy elements and paints included. The products do not contain any hazardous substances according to the Resource Conservation and Recovery Act (RCRA), Subtitle 3. The products 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.

Methodological Framework

Declared Unit

The declared unit for this EPD is one metric ton of steel construction products. Note that comparison of EPD results on a mass basis alone is insufficient and should consider the technical performance of the product.

Table 1. Declared Unit

NAME	VALUE	UNIT
Declared Unit	1	metric ton
Density (typical)	7,850	kg/m^3

System Boundary

This EPD is "cradle-to-gate" in scope. The life cycle stages included in the assessment represent the product stage (modules A1-A3).

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PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
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
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

* X = module included, MND = module not declared

Allocation

No multi-output allocation was required in the foreground system of the study. Allocation of background data (energy and materials) taken from the GaBi 2021 databases is documented online at http://www.gabi-software.com/america/support/gabi/

Cut-off Rules

In lieu of arbitrary cut-off criteria, all available energy and material flow data were included in the model for processes within the system boundary.

In cases where no matching life cycle inventories were available to represent a flow, proxy data were applied based on conservative assumptions regarding environmental impacts.

Data Sources

The LCA model was created using the GaBi 10 software system for life cycle engineering, developed by Sphera (Sphera, 2021). Background life cycle inventory data for raw materials and processes were obtained from the GaBi 2021 database (CUP 2021.1). Primary manufacturing data were provided by Searing.

Data Quality

A variety of tests and checks were performed by the LCA practitioner throughout the project to ensure high quality of the completed LCA. Checks included an extensive internal review of the project-specific LCA models developed as well as the background data used. A full data quality assessment is documented in the background report.

Period Under Review

Primary data were collected for HSS production during the year 2019 and 2020. Background data for steel coil production was taken from The American Iron and Steel Institute (AISI) and represents steel production during 2017. Fabrication data was taken from The American Institute of Steel Construction (AISC) and represents fabrication activity in 2019 and 2020 (AISI, 2021) (AISC, 2021). This analysis is intended to represent production in 2020.

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Estimates and Assumptions

The underlying study was conducted in accordance with the PCR. While this EPD has been developed by industry experts to best represent the product system, real life environmental impacts of HSS products may extend beyond those defined in this document.

All of the raw materials and energy inputs have been modeled using processes and flows that closely follow actual production data on raw materials and processes. All of the reported material and energy flows have been accounted for. The HSS inventory data was collected as part of The Steel Tube Institute (STI) industry-average EPD (STI, 2021). Where inbound transportation data was incomplete, a distance of 500 miles by truck was used.

Proxy data were applied to some materials where no matching life cycle inventories were available, as documented in the background report.

Technical Information and Scenarios

Manufacturing

Hollow structural sections are manufactured by cold-forming steel coil into tubes. Hot-rolled coil is first slit into sections of appropriate width. The narrower coils are then uncoiled and passed through a series of rollers that form the continuous sheet into tubes. Tube cross-sections can be rectangular, round, or elliptical, depending upon the intended application. The two edges of the coil are welded together via an electric resistance welding process and the product is then cut to length. Once manufactured, HSS can be powder coated or primed—or left uncoated. The tubes are subsequently packaged for shipment.

The primary input to HSS production is the steel itself, although small amounts of process and coating materials are needed. Electricity is used for manufacturing and to move the materials. Manufacturing produces some metal scrap. The scrap generated during manufacturing is assumed to be produced at the same quality as used by the upstream metal production processes. Therefore, the scrap from manufacturing is treated assuming open-loop recycling.

Fabrication results are taken from the American Institute of Steel Construction (AISC) industry average EPD (AISC, 2021)

Inbound Transportation

Inbound transportation distances and modes for steel and process materials were collected from each site.

Transportation

Transportation to the customer or construction site is outside the scope of this EPD. Transportation (A2) from the HSS producers to the fabricator is included in the analysis and in this report.

Product Installation

Installation is outside the scope of this EPD.

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Use

Product use is outside the scope of this EPD.

Reuse, Recycling, and Energy Recovery

Product reuse, recycling, and incineration for energy recovery are outside the scope of this EPD.

Disposal

Product disposal is outside the scope of this EPD.

Environmental Indicators Derived from LCA

North American life cycle impact assessment (LCIA) results are declared using TRACI 2.1 (Bare, 2012; EPA, 2012) methodology, with the exception of GWP which is reported using the IPCC AR5 (IPCC, 2013) methodology, excluding biogenic carbon. Primary energy use represents the lower heating value (LHV) a.k.a. net calorific value (NCV).

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

Fabrication requires 1.08 metric tons of HSS per 1 metric ton of fabricated product (AISC, 2021). A1 includes production of all 1.08 metric tons of HSS.

Table 1. LCIA results, per 1 metric ton of fabricated HSS

PARAMETER	UNIT	TOTAL	A1	A2	A3
GWP 100	kg CO_2 eq.	1.92E+03	1.78E+03	4.46E+01	9.67E+01
ODP*	kg CFC 11 eq.	1.62E-09	-2.04E-12	8.67E-14	1.62E-09
AP	kg SO_2 eq.	4.54E+00	4.21E+00	1.83E-01	1.52E-01
EP	kg N eq.	2.51E-01	2.23E-01	1.64E-02	1.23E-02
SFP	kg O_3 eq.	8.64E+01	7.97E+01	4.44E+00	2.23E+00
ADP_{fossil}	MJ surplus	1.72E+03	1.54E+03	7.16E+01	1.04E+02

* ODP has limited relevance due to the absence of ozone-depleting emissions in the LCI, in both the background and foreground data.

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

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

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Table 2. Resource use results, per 1 metric ton of fabricated HSS

PARAMETER	UNIT	TOTAL	A1	A2	A3
RPR_E	MJ LHV	1.28E+03	1.00E+03	6.24E+01	2.16E+02
RPR_M	MJ LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$	MJ LHV	2.47E+04	2.25E+04	6.91E+02	1.47E+03
$NRPR_M$	MJ LHV	1.26E+01	1.80E-02	0.00E+00	1.26E+01
SM	kg	5.13E+02	5.12E+02	0.00E+00	7.52E-01
RSF	MJ LHV	–	–	–	–
NRSF	MJ LHV	–	–	–	–
RE	MJ LHV	–	–	–	–
FW	m^3	9.47E+00	8.60E+00	1.81E-01	6.82E-01

Table 3. Output flows and waste categories results, per 1 metric ton of fabricated HSS

PARAMETER	UNIT	TOTAL	A1	A2	A3
HWD	kg	5.43E-01	2.11E-01	0.00E+00	3.32E-01
NHWD	kg	9.66E+00	0.00E+00	0.00E+00	9.66E+00
HLRW	kg	9.31E-04	7.82E-04	3.16E-05	1.18E-04
ILLRW	kg	7.78E-01	6.53E-01	2.64E-02	9.85E-02
CRU	kg	--	–	–	–
MR	kg	1.03E+02	2.54E+01	0.00E+00	7.71E+01
MER	kg	--	–	–	–
EE	MJ LHV	--	–	–	–

To align with the PCR, “product specific EPDs which include averaging shall report the range of results for all IPCC AR5 and TRACI indicators for products included in the average.” The min and max results presented in Table 4 represent the facilities with the lowest (best) and highest (worst) impacts, respectively. Min and max facilities are determined for each impact category separately. The mean and median do not take production volumes across facilities into account (i.e., it is a calculation based on each individual facility as a data point), while the weighted average presented in Table 1 through Table 3 is calculated via production volume weightings reported by each participating facility. Fabrication represents the US average; therefore, it does not change between sites.

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Table 4. Statistical metrics across LCIA results, per 1 metric ton of fabricated HSS

PARAMETER	UNIT	MIN (A1-A3)	MAX (A1-A3)	MAX/MIN RATIO (A1-A3)	MEAN (A1-A3)	MEDIAN (A1-A3)
GWP 100	kg CO_2 eq.	1.74E+03	1.82E+03	1.05E+00	1.78E+03	1.78E+03
ODP	kg CFC 11 eq.	-2.40E-12	-1.62E-12	6.77E-01	-2.01E-12	-2.01E-12
AP	kg SO_2 eq.	4.04E+00	4.41E+00	1.09E+00	4.22E+00	4.22E+00
EP	kg N eq.	2.11E-01	2.36E-01	1.12E+00	2.23E-01	2.23E-01
SFP	kg O_3 eq.	7.52E+01	8.51E+01	1.13E+00	8.01E+01	8.01E+01
ADP_{fossil}	MJ surplus	1.49E+03	1.60E+03	1.07E+00	1.55E+03	1.55E+03

Searing Industries' HSS product is manufactured at 2 different facilities. The results presented above represent a production-weighted average of these facilities. To understand how the GWP may vary between sites, facility-specific GWP100 results are presented below.

Table 5. Facility-specific GWP100 results, per 1 metric ton of unfabricated HSS

GWP 100 (KG CO_2 EQ)	A1	A2	A3	TOTAL	CRADLE-TO-GATE, MILL PRODUCT*
Rancho Cucamonga, CA	1.82E+03	4.46E+01	9.67E+01	1.96E+03	1.69E+03
Cheyenne, WY	1.74E+03	4.46E+01	9.67E+01	1.88E+03	1.61E+03

Visualization of Life Cycle Impact Assessment

The relative contribution of each life cycle stage to the overall cradle-to-gate impact are presented in Figure 1.

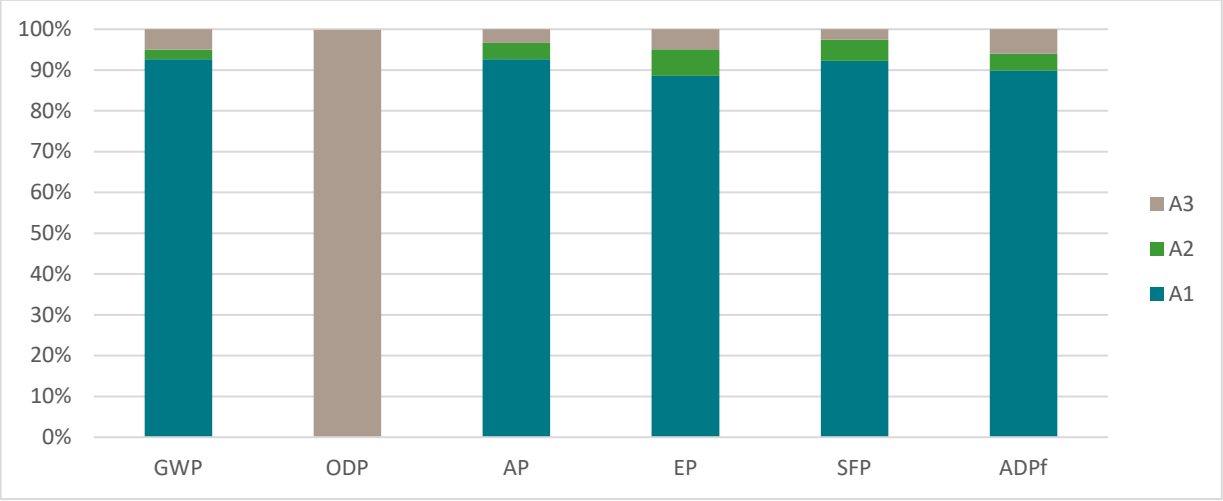

Figure 1: Relative contribution by life cycle stage for 1 metric ton of hollow structural sections

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The vast majority of potential environmental impacts are driven by the upstream burdens of steelmaking, therefore A1 is the dominant contributor across LCIA indicators.

To better understand sources of potential environmental impacts in Searing Industries Tube's manufacturing process, Figure 2 presents relative results for HSS manufacturing (A1 only). Potential environmental impacts for HSS manufacturing are dominated by upstream burdens of steelmaking.

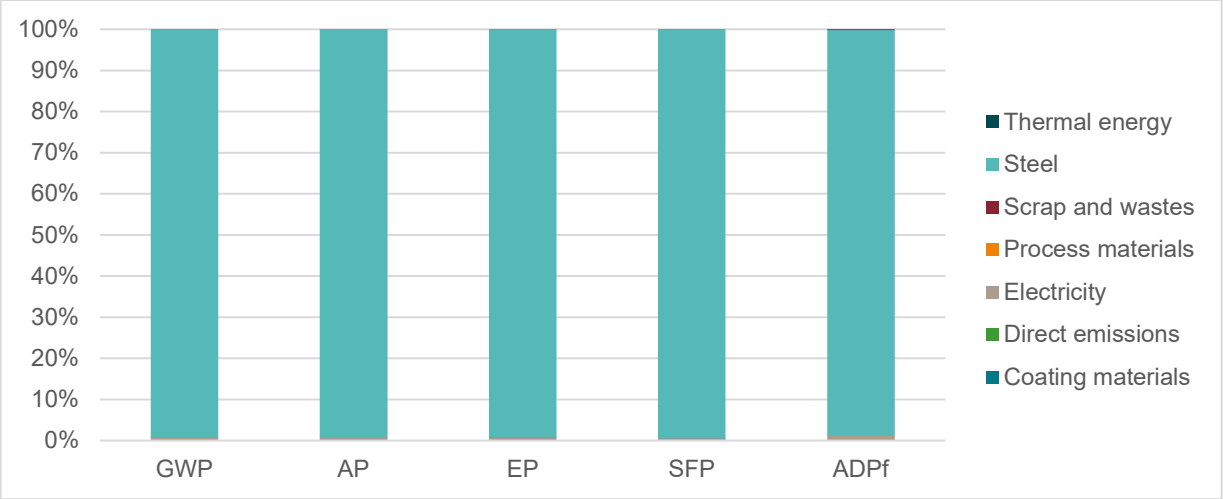

Figure 2: Relative contribution by manufacturing component for 1 metric ton of un-fabricated hollow structural sections

Interpretation

The cradle-to-gate potential environmental impacts of Searing Industries' fabricated HSS products are driven by steel coil production and HSS manufacturing (A1).

Additional Environmental Information

Environment and Health During Manufacturing

For information on safety and health guidelines for Searing products, please refer to Searing's Safety Data Sheets for each product which can be found online at https://www.searingindustries.com/resources/. Please follow all recommended guidelines.

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Environmental Activities and Certifications

Being California based, Searing Industries is subject to some of the most stringent environmental laws in the country, and has built in numerous routine recycling procedures to ensure the lowest amount of waste output possible. This sustainable approach was carried over to Searing's Wyoming plant when it was constructed, where production has successfully resulted in zero hazardous waste output. Searing has a long history as a responsible manufacturer and employer with zero infractions for health or safety violations at either of its manufacturing facilities.

Further Information

For more information, please visit https://www.searingindustries.com/

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