ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025 AND ISO 21930:2017

SmartEPD-2024-029-0152-01

Steelcon SIN Beam

Steelcon

SMART EPD CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION

Date of Issue: Jul 18, 2024

Expiration: Jul 18, 2029

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General Information

Steelcon

8100 Highway 27, Suite 401, Woodbridge, ON L4H 3N2

416.798.3343

info@steelcongoc.com steelcongoc.com

Product Name:	Steelcon SIN Beam
Declared Unit:	1 t
Declaration Number:	SmartEPD-2024-029-0152-01
Date of Issue:	July 18, 2024
Expiration:	July 18, 2029
Last updated:	July 18, 2024
EPD Scope:	Cradle to gate A1 - A3
Market(s) of Applicability:	North America

Reference Standards

Standard(s):	ISO 14025 and ISO 21930:2017
Core PCR:	UL PCR for Building-Related Products and Services Part A v.3.2, ISO 21930:2017 Date of issue: December 12, 2018
Sub-category PCR:	UL Part B: Designated Steel Construction Products v.2 Date of issue: December 31, 2020 Valid until: December 31, 2025
Sub-category PCR review panel:	Contact Smart EPD for more information.
General Program Instructions:	Smart EPD General Program Instructions v.1.0, November 2022

Verification Information

LCA Author/Creator:	Mandi Wesley | mandi.wesley@mantledev.com
EPD Program Operator:	Smart EPD | info@smartepd.com | www.smartepd.com 585 Grove St., Ste. 145 PMB 966, Herndon, VA 20170, USA

Verification:

Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071 : External

Tom Etheridge | EarthShift Global | Thomas@earthshiftglobal.com

Independent external verification of EPD, according to ISO 14025 and reference PCR(s) : External

Tom Etheridge | EarthShift Global | Thomas@earthshiftglobal.com

Limitations, Liability, and Ownership

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 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 results for upstream or downstream of the life cycle stages declared. 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. The EPD owner has sole ownership, liability, and responsibility for the EPD.

Organization Information

Steelcon is a group of structural steel companies that design, fabricate, and build industrial, commercial, institutional, and multi-residential projects. With more than 712,000 square feet of fabrication space across five facilities strategically located in Canada and the U.S., combined with an unmatched in-house team of engineers, project managers, field supervisors, and erectors, Steelcon provides the most innovative, highly engineered, and cost-effective structural steel solutions across the continent.

Further information can be found at: https://www.steelcongoc.com/

Product Description

The SIN Beam product is a structural steel section and may be used for flexural members such as roof or floor beams, as components subjected to axial loads such as columns, or as combined bending and axial members such as in moment frames or wind columns. The optimal application is an alternative to a rolled or welded wide flange shape, a joist, or a joist girder section with a depth between 300mm and 1800mm. SIN Beam is manufactured from 350W G40.21 steel (CSA Group, 2013).

Steelcon produces the SIN Beam in various sizes, from three sections of steel sheet joined together by welds. Two flat sections of sheet are used to form the parallel flanges of the beam, while the third section of sheet is cold formed into a sinusoidal ("SIN") shape and welded as the beam's web. This results in a light and efficiently manufactured steel beam with higher load capacity to weight ratio due to the sinusoidal shape and can reduce the amount of steel required in a structure by up to 30 per cent. No packaging is used for SIN Beam shipping, so packaging mass is not included.

Further information can be found at: https://www.steelcongoc.com/sin-beam

Product Information

Declared Unit:	1 t
Mass:	1000 kg

Product Specificity:

- ✗ Product Average
- ✓ Product Specific

Averaging:

This EPD covers the fabrication of the SIN Beam within the 2024 calendar year at Steelcon's facility in St. Catharines, Ontario, Canada, including upstream manufacturing at a specified mill in the USA. As of April 2024, Steelcon purchases all its steel for SIN Beam from NorthStar BlueScope Steel in Delta, Ohio. In alignment with UL Environment Part A, three months of data can suffice for a full year of production for new processes influencing manufacturing. As a result, steel purchasing data from April to June 2024 are used to represent manufacturing in 2024.

Canadian, especially Ontario-specific, data is preferred to align with the geographical coverage of most processes in the LCA. However, North American data was considered where processes occur across the continent, and global data was used as a proxy where regional-specific data is unavailable.

The length of a one metric ton beam varies from 3 meters (9.7 feet) to 54 meters (177 feet) depending on the proportions, with a median of 8.3 meters (27.3 feet). Where the beam's size and proportions may impact the inputs' quantities, median beam data was chosen. This EPD is only for the SIN Beam made entirely from coil. Steelcon also manufactures heavy flange SIN Beams using plates for the flanges; however, these are excluded since the focus is on a "typical" SIN Beam.

Plants

Steelcon St. Catharines
87 Grantham Ave S, St. Catharines, ON L2P 3H3, Canada

Product Specifications

Product Classification Codes:	UNSPSC - 30101700 EC3 - Steel -> StructuralSteel
Form Factor:	Steel >> StructuralSteel
Steel Type:	Alloy
Yield Tensile Strength:	350 MPa

Material Composition

Material/Component Category	Origin	% Mass
Hot-Rolled Steel Coil	North America	100

Hazardous Materials
No regulated hazardous or dangerous substances are included in this product.

EPD Data Specificity

Primary Data Year:	2024
Manufacturing Specificity:	✗ Industry Average ✗ Manufacturer Average ✓ Facility Specific

Software and LCI Data Sources

LCA Software:	openLCA v. 2.0
LCI Foreground Database(s):	Ecoinvent v. 3.9.1 | Ontario, Canada | Cut-off
LCI Background Database(s):	Ecoinvent v. 3.9.1 | World | Cut-off

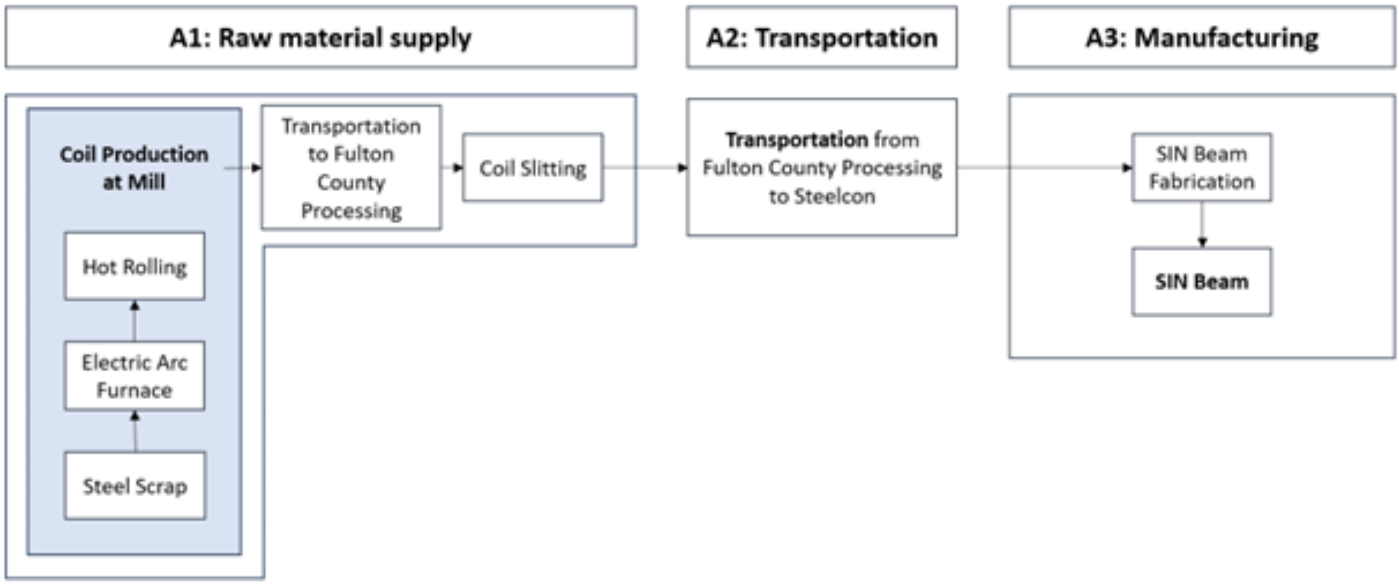
Renewable Electricity

Renewable electricity is used:	No

System Boundary

Production	A1	Raw material supply	✓
	A2	Transport	✓
	A3	Manufacturing	✓
Construction	A4	Transport to site	ND
	A5	Assembly / Install	ND
Use	B1	Use	ND
	B2	Maintenance	ND
	B3	Repair	ND
	B4	Replacement	ND
	B5	Refurbishment	ND
	B6	Operational Energy Use	ND
	B7	Operational Water Use	ND
End of Life	C1	Deconstruction	ND
	C2	Transport	ND
	C3	Waste Processing	ND
	C4	Disposal	ND
Benefits & Loads Beyond System Boundary	D	Recycling, Reuse Recovery Potential	ND

Product Flow Diagram



Life Cycle Module Descriptions

A1
Steelcon purchases all its steel for SIN Beam from Timberlea Steel. Timberlea Steel supplies EAF scrap steel coil produced by North Star BlueScope in Delta, Ohio. North Star BlueScope's EPD (Garvey, 2023) for hot banded steel coil is used to model steel production impacts for SIN Beam in OpenLCA.

Slitting is performed at Fulton County Processing on the steel coils. Due to the lack of specific data on the machinery or slitting process, an estimation of medium voltage ReliabilityFirst Corporation (RFC) region electricity demand was made to represent the environmental impacts of coil slitting. This estimation accounts for the electricity consumption of the slitting machine located in Ohio.

Steel production and transportation impacts upstream of Steelcon are addressed through OpenLCA's ecoinvent processes and the aforementioned EPD, covering A1-A3. At the steel slitting facility, it was assumed that the slitting process of steel sheets could be represented as an ecoinvent electricity consumption impact based on the specifications of a researched slitting machine (Formetal Technology, n.d.). Steel transportation from the mill to Fulton County Processing is included in life cycle module A1. This transportation is modeled as truck transportation based on communication with Steelcon.

A2
Life cycle module A2 accounts for transportation from Fulton County Processing to Steelcon. Based on correspondence with Steelcon, transportation is modeled as truck transport.

A3
The final stage of SIN Beam production occurs at Steelcon's manufacturing facility. This involves welding sections of steel coil together (fabrication) to form the SIN Beam. Steelcon provided 2022 annual data on the facility's electricity consumption and natural gas heating. Electricity is represented based on the medium voltage process from ecoinvent specific to Ontario. Electricity consumption was adjusted proportionally to account for the impacts of the SIN Beam line specifically.

The default heating process was used rather than the low Nox option supplied by ecoinvent since no indication of low Nox heating was given. The heating process from ecoinvent is modified such that the input electricity is Ontario market-specific. Heaters are only run from November to April, and 12-15% of the facility's heating bill is attributable to Steelcon. Since 60% of the heaters are located specifically on the SIN Beam production line (as opposed to Steelcon's line for other components), heating impacts were further reduced to account for this.

Emissions are released from Steelcon's facility directly because of arc welding, based on the MAG welding process in ecoinvent. The provided data for the welding gas used by Steelcon (Messer, n.d.a; Messer, n.d.b) is similar to the welding gas consumed in the OpenLCA MAG welding process.

LCA Discussion

Allocation Procedure

All allocation in this study comes from that inherent in ecoinvent 3.9.1. No additional allocation method was followed beyond that.

Steel purchased by Steelcon for one quarter of 2024 was used to assign impacts to the specific steel mill that supplies all SIN Beam steel. An EPD from the steel mill was obtained from the manufacturer.

Transportation distances were determined using Google Maps between Fulton County Processing's facility at 7800 OH-109, Delta, Ohio, and North Star BlueScope's mill at 6767 County Road 9, Delta, Ohio. These transportation distances were included in the A1 module associated with raw materials and manufacturing. Fulton County Processing's facility in Delta, Ohio was also used to determine transportation distances to Steelcon for module A2.

For all electricity use in Ontario, the ecoinvent 3.9.1 process "market for electricity, medium voltage | electricity, medium voltage | EN15804, U - CA - ON" is used to model impacts (0.07634 kg CO2e / kWh). Ecoinvent 3.9 electricity generation data for Ontario is based on Statistics Canada generation data for 2020 (ecoinvent, n.d.). Slitting occurs in Delta, Ohio, so the ecoinvent 3.9.1 process for the electricity input is "market for electricity, medium voltage | electricity, medium voltage | EN15804, U – US-RFC" (0.51026 kg COe / kWh), a process based on the EPA's eGRID database (ecoinvent, n.d.), to correspond to the correct North American Electricity Reliability Corporation (NERC) region (U.S. Environmental Protection Agency, 2024b).

Cut-off Procedure

All known processes impacting the SIN Beam production were noted in this LCA report. No decisions were made to exclude any aspects from the analysis.

Data Quality Discussion

An evaluation of the data quality is described below.

Temporal
Utility data was from the calendar year 2022 to represent a recent full year of production. It is not expected that utility consumption will change significantly year over year. Steel mill data for purchased steel was only obtained for one quarter of 2024; however, this was considered representative of Steelcon's future steel purchases.

Geographical
Steelcon's facility is in the Canadian province of Ontario. Ontario-specific LCI data was used, where appropriate and possible, to be representative geographically. Processes in OpenLCA pertaining to Steelcon's operations were modified to use Ontario electricity emission factors or Canadian industry average natural gas emission factors for gas. The nearest representative province to Ontario was Quebec, so this option was selected for heating processes. For modeling electricity consumption at Fulton County Processing, electricity for the ReliabilityFirst NERC region was used as it encompasses Delta, Ohio.

Technological
The LCA sought to match the fabrication processes used by Steelcon and Fulton County Processing. If exact processes within ecoinvent were unavailable, similar processes were modified to be more representative of actual processes, or proxies were made to represent likely energy consumption impacts.

Results

Environmental Impact Assessment Results

IPCC AR5 GWP 100, TRACI 2.1, CML 2016

per 1 t of product.

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

Impact Category	Method	Unit	A1	A2	A3	A1A2A3
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	1110	79.4	25.2	1220
ODP	TRACI 2.1	kg CFC 11 eq	0.000072	0.00000131	2e-7	0.0000735
AP	TRACI 2.1	kg SO2 eq	4.33	0.337	0.0288	4.7
EP	TRACI 2.1	kg N eq	3.35	0.0764	0.0196	3.45
POCP	TRACI 2.1	kg O3 eq	60.6	9.29	0.655	70.5
ADP-fossil	CML 2016	MJ	11000	1020	337	12400

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

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 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. 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.

Resource Use Indicators

per 1 t of product.

Indicator	Unit	A1	A2	A3	A1A2A3
RPRE	MJ	443	14.8	83	540
RPRM	MJ	ND	ND	ND	ND
NRPRE	MJ	10800	1040	818	12700
NRPRM	MJ	426	96.7	16	538
SM	kg	0.882	0.85	0.864	2.6
RSF	MJ	0.206	0.109	0.0736	0.388
NRSF	MJ	0.158	0.455	0.411	1.02
RE	MJ	ND	ND	ND	ND
FW	m3	8.7	0.143	1.56	10.4

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

Waste and Output Flow Indicators

per 1 t of product.

Indicator	Unit	A1	A2	A3	A1A2A3
HWD	kg	0.0252	1.29	0.912	2.23
NHWD	kg	2.15	69.2	1.42	72.7
CRU	kg	ND	ND	ND	ND
MFR	kg	78.8	0.724	0.701	80.2
MER	kg	ND	ND	ND	ND
HLRW	kg	0.0000252	0.0000709	0.0102	0.0103
ILLRW	kg	0.000104	0.000169	0.00338	0.00365
EE	MJ	ND	ND	ND	ND

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

Interpretation

The impact of A2 transportation and A3 fabrication at Steelcon is minor across most LCI impact categories examined. The A1 module dominated all impact categories, indicating the prominent role that steel milling plays in the environmental impacts of steel products. Life cycle module A2 transportation has a minor but non-trivial impact on GWP, highlighting the significant emissions intensity of truck transportation.

Several assumptions were made in the analysis. Specifically, Steelcon purchased steel from North Star BlueScope through Timberlea for one fiscal quarter. They indicated that this steel would constitute their entire upstream supply for SIN Beam production in the future.

Due to the lack of details about the specific truck type used for transportation, a generic freight process was modeled. However, Steelcon did confirm that transportation was conducted by truck.

It was also assumed that the welding at Steelcon can be approximated using a modified ecoinvent MAG welding process and that slitting can be represented as an impact on electricity consumption. Although welding has an impact, it is relatively minor and does not significantly contribute to overall uncertainty.

In cases where the LCA is limited by the lack of geographical specificity in ecoinvent, Rest of World (RoW) processes were used instead of Canadian or North American-specific data.

References

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