

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025 AND ISO 21930:2017

SmartEPD-2023-006-0019-01

Engineered Cast Steel Products



Date of Issue:
Oct 26, 2023

Expiration:
Oct 26, 2028

Last updated:
Jul 05, 2024

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General Information

Cast Connex Corporation

100 Consilium Pl #311, Scarborough, ON M1H 3E3, Canada
1-888-681-8786
info@castconnex.com castconnex.com



Product Name:	Engineered Cast Steel Products
Declared Unit:	1 t
Declaration Number:	SmartEPD-2023-006-0019-01
Date of Issue:	October 26, 2023
Expiration:	October 26, 2028
Last updated:	July 05, 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 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:	Vicki Rybl vicki.rybl@beath.us
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 |  Thomas@earthshiftglobal.com

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

External

 Tom Etheridge |  Thomas@earthshiftglobal.com

Limitations, Liability, and Ownership

No comparisons or benchmarking is included in this EPD. Environmental declarations from different programs based upon differing PCRs may not be comparable (ISO 14025). 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 Life Cycle Inventory (LCI) datasets may lead to different results for upstream or downstream of the life cycle stages declared.

Organization Information

Cast Connex Corporation (CAST CONNEX) is a supplier of Engineered cast steel products, leveraging a global supply chain of trusted steel foundry partners to manufacture the components that CAST CONNEX designs. CAST CONNEX products are used in the construction of buildings, bridges, and other structures all over the world.

Further information can be found at: <https://www.castconnex.com/>

Product Description

CAST CONNEX standard and custom steel connectors are used in architectural applications for buildings and bridges to provide structural performance, attractive appearance, and construction economy. CAST CONNEX products are often used for geometrically complex connections, heavily loaded connections, connections with special loading conditions, and applications in which connections are left exposed and appearance is important.

Further information can be found at:

Product Information

Declared Unit:	1 t
Mass:	1000 kg
Product Specificity:	☒ Product Average
	☒ Product Specific

Averaging:

This product-specific EPD was developed based on primary annual manufacturing data for CAST CONNEX engineered cast steel products. The EPD represents products manufactured at one facility. No averaging across facilities was required.

Plants



Electro Aco Altona S.A.
Rua Engenheiro Paul Werner, 925 - Itoupava Seca, Blumenau - State of Santa Catarina, Brazil

Product Specifications

Product Classification Codes:	UNSPSC - 31101620 UNSPSC - 31121203 Masterformat - 05 12 00 Masterformat - 05 13 00 EC3 - Steel
Form Factor:	Steel
Steel Type:	Alloy
Yield Tensile Strength:	50 ksi

Material Composition

Material/Component Category	Origin	% Mass
Steel	None	98
Alloying Elements	None	2

Packaging Material	Origin	kg Mass
Wood Pallets	None	6
Plastic Banding	None	0.004
Plastic Bag	None	0.5

Hazardous Materials

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

EPD Data Specificity

Primary Data Year:	2021
Manufacturing Specificity:	✗ Industry Average ✓ Manufacturer Average ✓ Facility Specific

Software and LCI Data Sources

LCA Software:	 GaBi v. 10.0
LCI Foreground Database(s):	
LCI Background Database(s):	 Ecoinvent v. 3.8  Cut-off system models

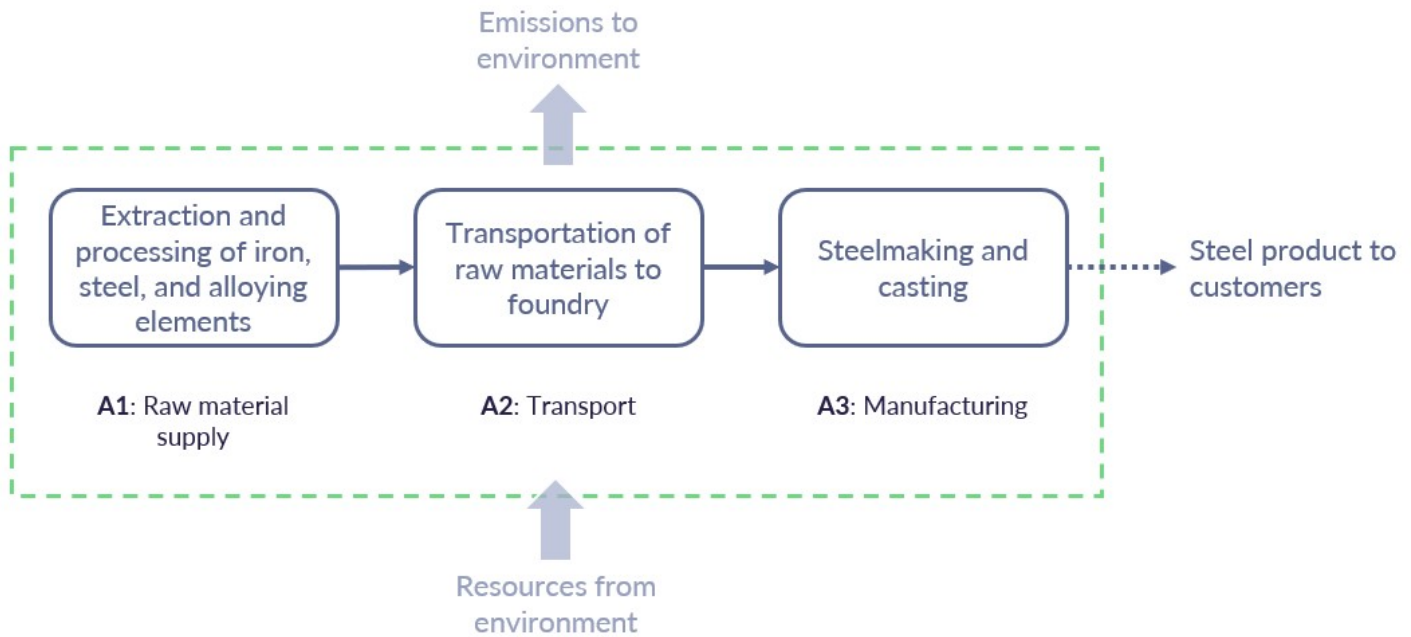
Renewable Electricity

Renewable electricity is used:	No
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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

The cast steel manufacturing process starts with design and structural analysis, which is followed by design for manufacturing, pattern manufacturing, and sand molding. Once the molds are prepared, scrap and other inputs are selected. This process uses an Electric Arc Furnace (EAF) to melt and pour the steel. When the steel is set, it is fettlered, inspected, machined, inspected again, and sent out. The process at Altona is powered by electricity sourced from the grid in Brazil and produces high quality cast steel construction products from scrap steel and various alloying elements.

LCA Discussion

No cut-off criteria were defined for this analysis. All available energy and material flow data were included in accordance with the system boundary. Proxy data were used as needed in the model to capture all considered life cycle impacts.

As the steel manufacturing produces a co-product of slag, allocation was used. The allocation method used is developed by the World Steel Association and EUROFER. The methodology accounts for the manner in which changes in inputs and outputs affect the production of co-products as well as material flows that carry specific inherent properties. This approach is consistent with the PCR and ISO 21930. No end-of-life allocation was defined as end-of-life treatment is outside of the system boundary.

Results

Environmental Impact Assessment Results

IPCC AR5 GWP 100, TRACI 2.1, CML 4.7

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	1.69e+2	2.11e+0	1.21e+3	1.38e+3
ODP	TRACI 2.1	kg CFC 11 eq	1.10e-5	1.14e-6	1.03e-4	1.15e-4
AP	TRACI 2.1	kg SO2 eq	1.16e+0	4.82e-2	6.57e+0	7.78e+0
EP	TRACI 2.1	kg N eq	1.76e+0	6.40e-3	2.85e+0	4.62e+0
POCP	TRACI 2.1	kg O3 eq	1.50e+1	1.03e+0	6.60e+1	8.20e+1
ADP-fossil	CML 4.7	MJ	1.56e+2	9.87e+0	1.59e+3	1.76e+3

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	6.46e+2	1.36e+0	1.53e+4	1.59e+4
RPRM	MJ	0	0	0	0
NRPRE	MJ	2.97e+3	7.64e+1	1.65e+4	1.95e+4
NRPRM	MJ	0	0	6.20e+1	6.20e+1
SM	kg	1.39e+3	0	0	1.39e+3
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m3	2.83e+0	9.08e-3	9.21e+1	9.49e+1

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, NRPRM or PENRM = 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	0	0	0
NHWD	kg	0	0	3.64e+2	3.64e+2
HLRW	kg	0	0	0	0
ILLRW	kg	0	0	0	0
CRU	kg	0	0	0	0
MFR	kg	0	0	4.53e+2	4.53e+2
MER	kg	0	0	0	0
EE	MJ	0	0	0	0
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 results of the LCA indicate that the electricity is the largest contributor to the CAST CONNEX product footprint across impact categories. Alloying element use is also a significant contributor. Impacts of the alloying elements used in cast steel produced by CAST CONNEX are driven by silicon feedstocks. The direct emissions of the steelmaking process are small compared to the impact of raw materials and energy use. The steel feedstock is a scrap product so the upstream burden is zero, therefore it does not contribute to the product footprint. Inbound transport of the steel product to the foundry is included and is a small contributor to the product footprint.

The study timeframe is for the year 2021 for Cast Connex manufacturing at Altona in Brazil. This study does not include comparisons or benchmarking. Environmental declarations from different programs based upon different PCRs may not be comparable.

Additional Environmental Information

The Electro Aço Altona S.A. environmental management system is in implementation as ISO 14001 certified (<https://www.altona.com.br/web/produtos/certificaes-altona>).

The Electro Aço Altona S.A. occupational health and safety management system is in implementation as ISO 45001 certified (<https://www.altona.com.br/web/produtos/certificaes-altona>).

Cast steel is not readily susceptible to destruction due to fire, water, or mechanical effects. Unprotected cast steel will exhibit reduced strength at elevated temperatures, but is not consumed and does not fuel fire. Unprotected cast steel in the presence of water and oxygen is susceptible to degradation due to corrosion; the resulting oxide has low toxicity and environmental impact. Cast steel degraded by mechanical effects may result in low toxicity dust that causes physical irritation.

References

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