ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025 AND ISO 21930:2017

SmartEPD-2024-028-0144-01

ChromX

SMART EPD CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION

Date of Issue:	Expiration:	Last updated:
Jul 12, 2024	Jul 12, 2029	Jul 15, 2024

General Information

CMC

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Product Name:	ChromX
Declared Unit:	1 t
Declaration Number:	SmartEPD-2024-028-0144-01
Date of Issue:	July 12, 2024
Expiration:	July 12, 2029
Last updated:	July 15, 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:	Juan David Villegas | juan@parqhq.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

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

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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

CMC is an innovative solutions provider helping build a stronger, safer, and more sustainable world. Through an extensive manufacturing network principally located in the United States and Central Europe, we offer products and technologies to meet the critical reinforcement needs of the global construction sector. CMC's solutions support construction across a wide variety of applications, including infrastructure, non-residential, residential, industrial, and energy generation and transmission.

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

Product Description

Scientifically engineered, ChromX® uncoated, concrete-reinforcing steel achieves its superior properties of corrosion resistance because of the patented steel microstructure that is formed during production. ChromX® exceeds project needs with innovation and precision and can be handled and fabricated like conventional rebar without the risk of damage, repair or inspection issues. ChromX® 9100 (ASTM A1035-CS) is almost entirely resistant to corrosion and has a 100-year product service life.

Manufactured from recycled scrap metal, ChromX® rebar can be found in structures around the world including bridges, roads, dams, tunnels, spillways, building structures and parking garages.

Further information can be found at: https://www.cmc.com/what-we-do/america/mill-products/chromx

Product Information

Declared Unit:	1 t
Mass:	1000 kg

Product Specificity:

- ✗ Product Average
- ✓ Product Specific

Averaging:

Averaging was not conducted for this EPD as the product is produced at a single facility.

Plants

CMC - Cayce, SC
CMC Steel South Carolina, New State Road, Cayce, SC, USA

Product Specifications

Product SKU(s):	ChromX 4100, ChromX 9100
Product Classification Codes:	EC3 - Steel -> RebarSteel Masterformat - 03 21 00 UNSPSC - 30103623
Form Factor:	Steel >> RebarSteel
Steel Type:	Alloy

Material Composition

Material/Component Category	Origin	% Mass
recycled steel	GLO	83-86
Chrome	RoW	5-11
Other	GLO	1-12

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

EPD Data Specificity

Primary Data Year:	2023
Manufacturing Specificity:	✗ Industry Average ✗ Manufacturer Average ✓ Facility Specific

Software and LCI Data Sources

LCA Software:	SimaPro v. 9.5
LCI Foreground Database(s):	Ecoinvent v. 3.9.1 | North America | cut-off
LCI Background Database(s):	Ecoinvent v. 3.9.1 | North America | cut-off

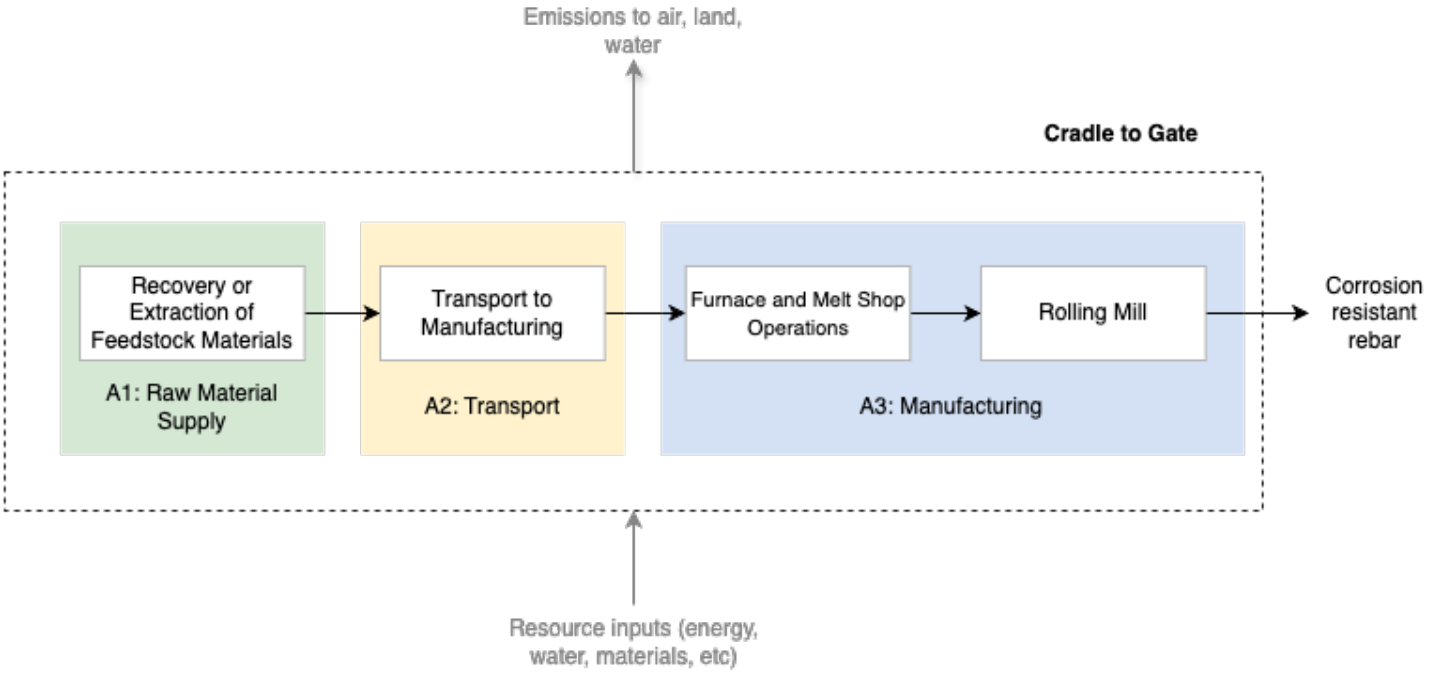
Renewable Electricity

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

The system boundary for the declaration is cradle-to-gate per the guiding PCR. The product life cycle stages included within this boundary are illustrated in the Product Flow Diagram. Raw Material Supply (A1): Includes all activities necessary for the production of raw materials including externally sourced steel scrap, alloys and other consumables. Transport to Manufacturing (A2): Includes the inbound transportation of all materials from suppliers to the Cayce facility in South Carolina. Manufacturing (A3): Includes all the activities necessary for the production of steel reinforcing bar. This stage includes: furnace and related process operation at the melt shop, creation of the billet, and the rolling of the product into an unfabricated reinforcing bar. The consumption of electricity, fuels, water and waste treatment are included in this life cycle stage. Fabrication of the steel reinforcing rebar takes place outside of this system boundary. Packaging of the end-products and all activities post cradle-to-gate for the steel products are also excluded, aligning with the study's objectives. The creation and maintenance of infrastructure and capital goods aren't covered, given their negligible impacts compared to equipment use over its operational lifetime. The time period over which inputs to and outputs from the system shall be accounted for is 100 years from the year for which the data set is deemed representative.

LCA Discussion

Allocation Procedure

At the Cayce facility, electricity, natural gas consumption, direct emissions, water use and waste/ recycled material outputs were allocated to rebar on a mass basis.The specific quantities of alloys added to the finished steel product were known and consequently allocated 100% to the the product as well as the natural gas consumption in the reheat furnace. In addition to that, an allocation between the finished steel product and slag was performed using a method developed by the World Steel Association and EUROFER (worldsteel and EUROFER, 2014) to be in line with CEN EN 15804 (CEN, 2019). The methodology takes into account the way in which changes in inputs and outputs affect the production of co-products. The method also takes account of material flows that carry specific inherent properties. This approach is conformant with the PCR and ISO 21930. Internally recycled scrap (closed-loop) was not accounted for in the A1 Materials as per ISO 21930 requirements. Internally recycled scrap (closed-loop) was not accounted for in the A1 Materials as per ISO 21930 requirements.

Cut-off Procedure

No cut-off criteria are defined for this study. The system boundary was defined based on relevance to the goal of the study. For the processes within the system boundary, all available energy and material flow data have been included in the model. In cases where no matching life cycle inventories are available to represent a flow, proxy data have been applied based on conservative assumptions regarding environmental impacts. The following activities were excluded from the system boundary:

Construction of major capital equipment Ï Maintenance and operations of support equipment Ï Human labor and employee commute Ï Ancillary materials within the melt shop Ï Packaging of final products Ï Recycling/recovery credits for manufacturing co-products Ï Research and development activities; Ï Long-term emissions

Data Quality Discussion

Data quality was analyzed following the criteria of the UN Environment Global Guidance on LCA database development. Temporal: Primary data were collected for the one-year period of January 2023 through December 2023 to ensure representativeness. Secondary data from the ecoinvent v3.9.1 database is typically representative of recent years. Geographical: Primary data represent CMC's production facilities in Durant, OK, Seguin, TX, Catoosa, OK. We aimed to use national, subnational or regional represetnative datasets whenever possible, In particular with process or materials with significant impact on the final results. Technological: Both primary and secondary data were tailored to the specific technologies studied, ensuring high technological representativeness.

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	3.42e+2	1.97e+2	1.31e+3	1.85e+3
ODP	TRACI 2.1	kg CFC 11 eq	5.32e-5	4.52e-6	2.36e-5	8.13e-5
AP	TRACI 2.1	kg SO2 eq	1.03e+0	6.05e-1	2.34e+0	3.97e+0
EP	TRACI 2.1	kg N eq	9.79e-1	1.47e-1	1.07e+0	2.20e+0
SFP	TRACI 2.1	kg O3 eq	9.77e+0	1.10e+1	4.06e+1	6.13e+1
ADP-fossil	CML 2016	MJ	7.97e+3	2.70e+3	1.60e+4	2.67e+4

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	4.80e+2	4.27e+1	3.28e+2	8.51e+2
RPRM	MJ	0	0	0	0
NRPRE	MJ	8.10e+3	2.76e+3	1.71e+4	2.79e+4
NRPRM	MJ	1.73e-1	1.34e-1	6.75e-1	9.82e-1
SM	kg	1.08e+3	0	0	1.08e+3
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
RE	MJ	0	0	0	0
FW	m3	4.89e-1	3.34e-1	2.19e+0	3.01e+0

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	0	2.00e-1	2.00e-1
NHWD	kg	0	0	5.15e+0	5.15e+0
CRU	kg	0	0	0	0
MFR	kg	0	0	2.48e+2	2.48e+2
MER	kg	0	0	0	0
HLRW	kg	0	0	0	0
ILLRW	kg	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

Environmental impacts are driven by the manufacturing phase, followed by the upstream production of raw materials. In particular, electricity use, direct emissions from the EAF, and alloying elements. Direct emissions and energy use are the largest contributors to GWP100, while energy use is the dominant contributor to ADPfossil. Melt shop operations account for a large fraction of direct emissions from the steelmaking process as well as a large fraction of steelmaking's environmental impact. Carbon dioxide emissions result from fossil fuel combustion as well as from combustion of the graphite electrodes and carbon used in the EAF. Ferrochromium addition to ChromX correspond to a large part of the raw material impacts. A material loss reduction programme in the process will contribute to the improvement of the product's environmental profile. Energy use in the reheat furnace for ChromX also contribute to increased environmental impacts. There will be a trade off, however, due to the increased service life that these additional steps provide to the products. This EPD includes results beyond the product stage (A1-A3); in such cases, when evaluating or comparing EPD results the entire life cycle module should be considered. The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

Percent contribution of each life cycle stage for ChromX

References

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- ISO 21930:2017, "Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services".
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- EPA 2020 National Overview: Facts and Figures on Materials, Wastes and Recycling, https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials#recycling
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