ENVIRONMENTAL PRODUCT DECLARATION

Merchant Bar and Light Structural Shapes

According to ISO 21930 and ISO 14025

ISSUED FEBRUARY 25, 2021
VALID UNTIL FEBRUARY 25, 2026
DECLARATION NUMBER EPD 189
PREPARED FOR COMMERCIAL METALS COMPANY

ASTM INTERNATIONAL
Standards Worldwide

Declaration Information

Declaration

Program Operator: ASTM International

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Product Information

Product Name: Merchant Bar & Light Structural Shapes

Product Definition: Carbon steel used in a structural capacity

Declaration Type: Business to business

PCR Reference:

- ISO 21930 (ISO, 2017)
- Part A: Product Category Rules for Building Related Products and Services (UL Environment, 2018)
- Part B: Designated Steel Construction Product EPD Requirements (UL Environment, 2020)

Validity / Applicability

Period of Validity: This declaration is valid for a period of 5 years from the date of publication

Geographic Scope: United States

PCR Review was conducted by:

- Thomas P. Gloria, Ph.D., Industrial Ecology Consultants
- Brandie Sebastian, JBE Consultants
- James Littlefield, Independent Consultant

Product Application and / or Characteristics

Carbon steel angles, channels, squares, flats and rounds used in a structural capacity. Merchant bars and light structural shapes are typically used in light commercial construction, joist manufacturing, industrial/commercial fabrication, and in the manufacturing process of trailers and other heavy equipment.

CSI MasterFormat Code 05 00 00: Metals. UNSPSC Commodity Code 302636 for Carbon steel bars.

Technical Drawing or Product Visual

Content of the Declaration

- Product definition and physical building-related data
- Details of raw materials and material origin
- Description of how the product is manufactured
- Data on usage condition, other effects and end-of-life phase
- Life Cycle Assessment results

Verification

Independent verification of the declaration and data, according to ISO 21930:2017 and ISO 14025:2006:

☐ internal ☒ external

This declaration and the rules on which this EPD is based have been examined by an independent verifier in accordance with ISO 14025.

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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 Section 3.10 For additional EPD comparability guidelines. Environmental declarations from different programs (ISO 14025) may not be comparable.

EPD Summary

This document is a Type III environmental product declaration by Commercial Metals Company that is certified by ASTM International (ASTM) as conforming to the requirements of ISO 21930 and ISO 14025. ASTM has assessed that the Life Cycle Assessment (LCA) information fulfills the requirements of ISO 14040 in accordance with the instructions listed in the referenced product category rules (PCR). The intent of this document is to further the development of environmentally compatible and sustainable construction methods by providing comprehensive environmental information related to potential impacts in accordance with international standards.

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.

Table 1: Impact assessment results for 1 metric ton of merchant bar

Indicator	Unit	Total (A1-A3)	A1	A2	A3
GWP 100	kg CO_2 eq	748	108	27.3	612
ODP	kg CFC-11 eq	1.42E-10	1.41E-10	3.63E-15	5.13E-13
AP	kg SO_2 eq	1.58	0.754	0.204	0.625
EP	kg N eq	0.0761	0.0148	0.016	0.0453
SFP	kg O_3 eq	24.9	7.14	5.66	12.1
ADP_{fossil}	MJ	609	32.1	53.3	523

Table 2: Impact assessment results for 1 short ton of merchant bar

Indicator	Unit	Total (A1-A3)	A1	A2	A3
GWP 100	kg CO_2 eq	678	98.0	24.8	555
ODP	kg CFC-11 eq	1.29E-10	1.28E-10	3.29E-15	4.65E-13
AP	kg SO_2 eq	1.43	0.684	0.185	0.567
EP	kg N eq	0.0690	0.0134	0.0145	0.0411
SFP	kg O_3 eq	22.6	6.48	5.13	11.0
ADP_{fossil}	MJ	552	29.1	48.3	474

Table 3: Impact assessment results for 1 metric ton of light structural shapes

Indicator	Unit	Total (A1-A3)	A1	A2	A3
GWP 100	kg CO_2 eq	754	98.1	33.6	622
ODP	kg CFC-11 eq	1.52E-10	1.51E-10	4.47E-15	5.58E-13
AP	kg SO_2 eq	1.48	0.595	0.236	0.644
EP	kg N eq	0.0794	0.013	0.0191	0.0473
SFP	kg O_3 eq	25.2	6.32	6.37	12.5
ADP_{fossil}	MJ	677	28.3	65.8	583

Table 4: Impact assessment results for 1 short ton of light structural shapes

Indicator	Unit	Total (A1-A3)	A1	A2	A3
GWP 100	kg CO_2 eq	684	89	30.5	564
ODP	kg CFC-11 eq	1.38E-10	1.37E-10	4.05E-15	5.06E-13
AP	kg SO_2 eq	1.34	0.54	0.214	0.584
EP	kg N eq	0.0720	0.0118	0.0173	0.0429
SFP	kg O_3 eq	22.9	5.73	5.78	11.3
ADP_{fossil}	MJ	614	25.7	59.7	529

Scope and Boundaries of the Life Cyce Assessment

The Life Cycle Assessment (LCA) was performed according to ISO 14040 (ISO, 2006) and ISO 14044 (ISO, 2006) following the requirements of the ASTM EPD Program Instructions and referenced PCR.

System Boundary: Cradle-to-gate
Allocation Method: Partitioning
Declared Unit: 1 metric ton / 1 short ton

Description of Organization

As one of the leading Electric Arc Furnace (EAF) steel manufacturers in the world, Commercial Metals Company (CMC) is an industry leader in sustainable steelmaking and is committed to producing steel from 100% recycled scrap metal. We began as a metals recycling company in 1915, and today we remain committed to minimizing our impact on the environment and to 'green' steelmaking - collecting recycled steel at our local recycling centers, melting scrap metal into new finished products at our steel mini-mills and micro-mills, and processing steel at our fabrication centers, heat-treating facilities and other metals-related operations.

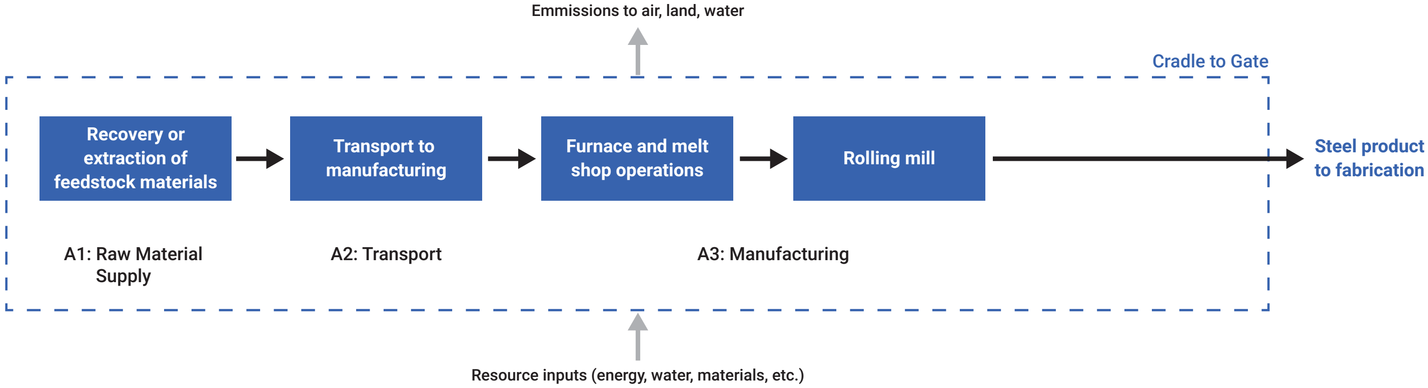
Product Description

Merchant bar refers to carbon steel used in light commercial construction, joist manufacturing, and industrial and commercial fabrication; this document refers to all carbon flats, hexes, rounds, squares and special sections that do not meet the definition of SBQ (special bar quality). Mill light structural shapes refers to carbon steel used within construction as structural support; this document refers to all carbon and HSLA (high-strength low-alloy) angles, channels, Tees and Zees. This EPD refers to merchant bar and light structural shapes that have not yet undergone fabrication. The reference service life of each product is not specified, as only modules A1-A3 are included.

Table 5: Technical Characteristics

Name	Value	Unit
Density	7,833	kg/m^3
Modulus of elasticity	199,900	N/mm^2
Coefficient of thermal expansion	11.8	$10^{-6}K^{-1}$
Thermal conductivity	80.4	W/(mK)
Melting point	1,504	°C
Electrical conductivity at 20°C	10,000,000	$\Omega^{-1}m^{-1}$
Minimum yield strength	By grade	N/mm^2
Minimum tensile strength	By grade	N/mm^2
Minimum elongation	By grade	%
Tensile strength	By grade	N/mm^2
ASTM Specification	ASTM A36, A529, A572, A588, A663, A709	-

Figure 1: Production Flow Diagram



Product Average

The 2019 production data used in this EPD considers all merchant bar and light structural steel produced by CMC during the year. The products are manufactured at five facilities across the United States. Results are weighted according to production totals at the locations for the 2019 calendar year.

Product Application

Carbon steel angles, channels, squares, flats and rounds are used in a structural capacity. Merchant bars and light structural shapes are typically used in light commercial construction, joist manufacturing, industrial/commercial fabrication, and in the manufacturing process of trailers and other heavy equipment.

Material Composition

The exact chemical composition of CMC's steel is declared on a mill test report, which is provided with each shipment and for each heat. In general, the steel will be >97% recycled iron and a total of 2% or less of the following elements: Carbon, Manganese, Silicon, Chromium, Nickel, Molybdenum, Vanadium, Copper, Tin, Sulfur and Phosphorus. The combined total of Molybdenum, Sulfur and Phosphorus is generally less than 0.1%. Elements exist in steel in their natural, unoxidized states, so any concerns over elements that are toxic only in certain valence states are mitigated.

All CMC merchant bar and light structural shapes are manufactured from 100% recycled scrap steel sourced within the United States.

Properties of Declared Product as Delivered

MBQ produced by Commercial Metals Company are defined by the following ASTM standards:

- **ASTM A36/A36M-19** Standard Specification for Carbon Structural Steel
- **ASTM A529/A529M-19** Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
- **ASTM A588/A588M-19** Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 Ksi [345 Mpa] Minimum Yield Point, with Atmospheric Corrosion Resistance
- **ASTM A572/A572M-18** Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
- **ASTM A588/A588M-19** Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 Ksi [345 Mpa] Minimum Yield Point, with Atmospheric Corrosion Resistance
- **ASTM A663/A663M-17** Standard Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties
- **ASTM A709/A709M-18** Standard Specification for Structural Steel for Bridges

Methodological Framework

Declared Unit

As can be seen in Table 6, both a declared unit of 1 metric ton and the optional unit of 1 short ton are used.

Table 6: Declared Unit

Name	Quantity	Required Unit	Quantity	Optional Unit
Declared Unit	1	metric ton	1	short ton
Density	7,833	kg/m^3	489	lb/ft^3

System Boundaries

The LCA was conducted for the product stage, A1-A3. Construction, use and end-of-life are excluded from the scope of the LCA.

Table 7: System Boundaries

Product Stage			Construction Stage		Use Stage					End-of-Life Stage				Benefits and loads beyond system boundary
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	D
Raw materials supply	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	De-construction	Transport	Waste processing	Disposal	Reuse, recovery and recycling potential
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

MND = module not declared

Allocation

Steel scrap: Steel scrap from the melt shop, rolling and other operations is internally recycled by steel mills. While whether a product is associated with a net consumption or generation of internal scrap is calculated by the model, this particular flow is not reported as part of the final LCIs as, from a mill-level perspective, all internal scrap is fed back into the melt shop.

Multi-product output: Where multiple finished products are produced, allocation sometimes had to be applied. While the melt shop knows exact formulations and energy requirements for each billet produced, the data for the rolling mill had to be allocated by total production time. In cases where melt shop and rolling mill water, waste and emissions could not be separated, impacts were allocated by product mass.

Co-products: Co-products during steel mill operations are allocated using a method used 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 the account of the manner 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 consistent with the PCR and ISO 21930. ISO 21930 takes precedence over EN15804, per the PCR Part A and Part B (UL Environment, 2020; UL Environment, 2018).

Table 8: Co-product allocation

Flow	% to Steel	% to Slag
Steel inputs	100.0	0.0
Slag	0.0	100
Steel scrap outputs	86.4	13.6
All other inputs/outputs	86.4	13.6

Cut-off Criteria

The cut-off rules, as specified in the PCR, did not have to be applied as none of the reported data was excluded.

Data Sources

All primary data were collected by CMC for annual production during the 2019 calendar year. All secondary data were obtained from the 2020 GaBi database (service pack 40). Where appropriate LCI data was not available proxy datasets were used, as documented in the background report.

Data Quality

Representativeness:

Temporal: All primary data were collected for the year 2019. All secondary data come from the GaBi 2020 databases and are representative of the years 2013-2020. As the study intended to represent the product systems for the reference year 2019, temporal representativeness is considered to be high.

Geographical: All primary and secondary data were collected specific to the regions under study. Where country- or region-specific data were unavailable, proxy data were used. Geographical representativeness is considered to be high.

Technological: All primary and secondary data were modeled to be specific to the technologies under study. Where technology-specific data were unavailable, proxy data were used. Technological representativeness is considered to be high.

Consistency: To ensure data consistence, all primary data were collected with the same level of detail, while all background data were sourced from the GaBi databases.

Reproducibility: Reproducibility is supported as much as possible through the disclosure of input-output data, dataset choices, and modeling approaches in this report. Based on this information, any third party should be able to approximate the results of this study using the same data and modeling approaches.

Uncertainty: Given the consistency within the data and the representativeness of the data, uncertainty associated with the model and results is low.

Data quality meets the requirements set forth in the PCR.

Estimates and Assumptions

One of the drivers of impacts associated with alloying elements is silicomanganese, for which no LCI data is available. Ferromanganese was used as a proxy, which is typically a precursor to silicomanganese production. As such, the impacts of silicomanganese use are likely underestimated.

Where insufficient data were available for inbound transportation of steel scrap, alloy elements and process materials, this study assumed an inbound transportation distance of 500 miles by truck.

Manufacturing

Scrap steel is melted in an electric arc furnace (EAF) which uses a combination of electrical energy and chemical energy in the form of carbon and oxygen injected into the steel. When the scrap has melted and reached approximately 3,000°F, the molten steel is poured (tapped) into a vessel called a ladle. During tapping, the majority of the alloys and fluxes are added to the steel to serve as deoxidizers and strengthening agents. The ladle is transported to the ladle metallurgical station (LMS), where the steel chemistry is refined to meet the chemical specifications. The ladle is then transported to a continuous caster where the steel is solidified into a solid, basic shape called a billet.

In the minimill process, billets then pass through a reheat furnace and travel into the rolling mill for processing. In the micromill process, the caster produces one continuous strand that is run directly into the rolling mill for processing. There is minimal reheating from an induction furnace in the micromill process, unlike the minimill process where billets are reheated in a gas furnace either from ambient temperature or hot/warm temperature after traveling from the caster.

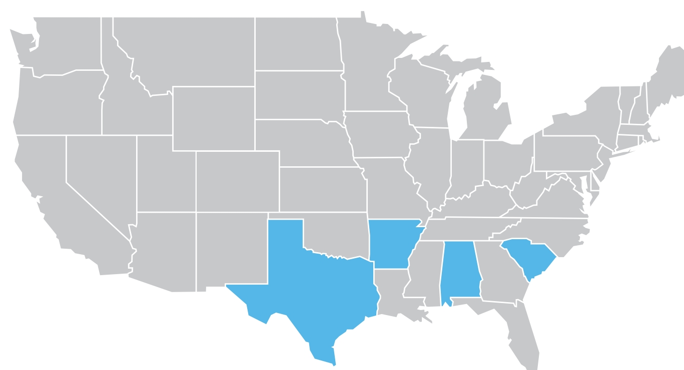
In the rolling mill, billets are passed through several mill stands which reduce the billet size and shape down to meet the final bar product specifications and emerge onto a cooling bed.

The micromill and minimill technology is the cleanest and most energy efficient steelmaking process available today. By using recycled scrap as raw material rather than virgin natural resources, CMC is reducing the need for mining of natural resources and reducing CO_2 emissions by 58%. For every ton of steel produced, CMC conserves 2,500 pounds of iron ore, 1,400 pounds of coal, and 120 pounds of limestone.

After cooling, finished steel products are placed in storage bays before being transported to their final destination.

Geographic Relevance

CMC's merchant bar and light structural shapes are manufactured in Birmingham, AL; Magnolia, AR; Cayce, SC and Seguin, TX.



Temporal Relevance

Data was collected for the 2019 calendar year.

Technological Relevance

Merchant bar and light structural shapes are manufactured using an electric arc furnace (EAF).

Life Cycle Assessment Results

Selection of LCIA Methodology and Impact Categories

The impact assessment categories and other metrics required by the PCR are shown in Table 10. GWP excludes biogenic carbon as the scope of the study is cradle-to-gate and there are no relevant bio-based raw materials present.

Table 10: Required declaration of environmental impacts, use of resources, and generation of waste

Indicator	Unit
Life Cycle Impact Assessment Results	
Global warming potential, excluding biogenic carbon (GWP 100)	kg CO_2 eq
Ozone depletion potential (ODP)	kg CFC-11 eq
Acidification potential (AP)	kg SO_2 eq
Eutrophication potential (EP)	kg N eq
Smog formation potential (SFP)	kg O_3 eq
Abiotic resource depletion potential of non-renewable (fossil) energy resources (ADP_{fossil})	MJ
Resource Use	
Renewable primary resources used as energy carrier (fuel) (RPR_E)	MJ LHV
Renewable primary resources with energy content used as material (RPR_M)	MJ LHV
Non-renewable primary resources used as an energy carrier (fuel) ($NRPR_E$)	MJ LHV
Non-renewable primary resources with energy content used as material ($NRPR_M$)	MJ LHV
Secondary materials (SM)	kg
Renewable secondary fuels (RSF)	MJ LHV
Non-renewable secondary fuels (NRSF)	MJ LHV
Recovered energy (RE)	MJ LHV
Use of net fresh water resources (FW)	m^3
Output Flows and Waste Categories	
Hazardous waste disposed (HWD)	kg
Non-hazardous waste disposed (NHWD)	kg
High-level radioactive waste, conditioned, to final repository (HLRW)	kg
Intermediate- and low-level radioactive waste, conditioned, to final repository (ILLRW)	kg
Components for re-use (CRU)	kg
Materials for recycling (MR)	kg
Materials for energy recovery (MER)	kg
Recovered energy exported from the product system (EE)	MJ LHV

It shall be noted that the above impact categories represent impact potentials, i.e., they are approximations of environmental impacts that could occur if the emissions would (a) actually follow the underlying impact pathway and (b) meet certain conditions in the receiving environment while doing so. In addition, the inventory only captures that fraction of the total environmental load that corresponds to the functional unit (relative approach). LCIA results are therefore relative expressions only and do not predict actual impacts, the exceed-ing of thresholds, safety margins or risks.

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 comparisons can be inaccurate and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Merchant Bar Results

Table 11: Resource use for 1 metric ton of merchant bar

Indicator	Unit	Total (A1-A3)	A1	A2	A3
RPR_E	MJ LHV	521	66.6	16.3	438
RPR_M	MJ LHV	-	-	-	-
$NRPR_E$	MJ LHV	7,490	1,080	400	6,010
$NRPR_M$	MJ LHV	511	-	-	511
SM	kg	1,130	1,120	-	2.36
RSF	MJ LHV	-	-	-	-
NRSF	MJ LHV	-	-	-	-
RE	MJ LHV	-	-	-	-
FW	m^3	2.47	0.887	0.0724	1.51

Table 12: Resource use for 1 short ton of merchant bar

Indicator	Unit	Total (A1-A3)	A1	A2	A3
RPR_E	MJ LHV	473	60.4	14.8	397
RPR_M	MJ LHV	-	-	-	-
$NRPR_E$	MJ LHV	6,790	980	363	5,450
$NRPR_M$	MJ LHV	463	-	-	463
SM	kg	1,020	1,020	-	2.14
RSF	MJ LHV	-	-	-	-
NRSF	MJ LHV	-	-	-	-
RE	MJ LHV	-	-	-	-
FW	m^3	2.24	0.805	0.0657	1.37

Table 13: Wastes and outputs for 1 metric ton of merchant bar

Indicator	Unit	Total (A1-A3)	A1	A2	A3
HWD	kg	0.517	-	-	0.517
NHWD	kg	7.48	-	-	7.48
HLRW	kg	0.000543	0.0000201	1.06E-06	0.000522
ILLRW	kg	0.454	0.0175	0.000883	0.436
CRU	kg	-	-	-	-
MR	kg	112	-	-	112
MER	kg	-	-	-	-
EE	MJ LHV	0.0372	-	-	0.0372

Table 14: Wastes and outputs for 1 short ton of merchant bar

Indicator	Unit	Total (A1-A3)	A1	A2	A3
HWD	kg	0.469	-	-	0.469
NHWD	kg	6.78	-	-	6.78
HLRW	kg	0.000493	0.0000182	9.61E-07	0.000473
ILLRW	kg	0.412	0.0159	0.000801	0.395
CRU	kg	-	-	-	-
MR	kg	102	-	-	102
MER	kg	-	-	-	-
EE	MJ LHV	0.0337	-	-	0.0337

Table 15: Impact assessment results for 1 metric ton of merchant bar

Indicator	Unit	Total (A1-A3)	A1	A2	A3
GWP 100	kg CO_2 eq	748	108	27.3	612
ODP	kg CFC-11 eq	1.42E-10	1.41E-10	3.63E-15	5.13E-13
AP	kg SO_2 eq	1.58	0.754	0.204	0.625
EP	kg N eq	0.0761	0.0148	0.016	0.0453
SFP	kg O_3 eq	24.9	7.14	5.66	12.1
ADP_{fossil}	MJ	609	32.1	53.3	523

Table 16: Impact assessment results for 1 short ton of merchant bar

Indicator	Unit	Total (A1-A3)	A1	A2	A3
GWP 100	kg CO_2 eq	678	98.0	24.8	555
ODP	kg CFC-11 eq	1.29E-10	1.28E-10	3.29E-15	4.65E-13
AP	kg SO_2 eq	1.43	0.684	0.185	0.567
EP	kg N eq	0.0690	0.0134	0.0145	0.0411
SFP	kg O_3 eq	22.6	6.48	5.13	11.0
ADP_{fossil}	MJ	552	29.1	48.3	474

To align with the PCR, "product specific EPDs which include averaging shall report the range of results for all TRACI indicators for products included in the average."

Table 17: Range of impact assessment results for 1 metric ton of merchant bar

Indicator	Unit	A1-A3 (min)	A1-A3 (max)
GWP 100	kg CO_2 eq	595	831
ODP	kg CFC-11 eq	9.4E-11	1.68E-10
AP	kg SO_2 eq	1.47	2.22
EP	kg N eq	0.0616	0.0895
SFP	kg O_3 eq	21.3	28.2
ADP_{fossil}	MJ	494	712

Table 18: Range of impact assessment results for 1 short ton of merchant bar

Indicator	Unit	A1-A3 (min)	A1-A3 (max)
GWP 100	kg CO_2 eq	540	754
ODP	kg CFC-11 eq	8.53E-11	1.52E-10
AP	kg SO_2 eq	1.33	2.01
EP	kg N eq	0.0559	0.0812
SFP	kg O_3 eq	19.3	25.6
ADP_{fossil}	MJ	448	646

To support the reporting of mill-specific GWP100 results, Table 19 and Table 20 present GWP100 results by site.

Table 19: Facility-specific GWP100 results for 1 metric ton of merchant bar

GWP 100 (kg CO_2 eq)	Total (A1-A3)	A1	A2	A3
Birmingham, AL	831	93.5	22.4	715
Magnolia, AR	813	140	86.8	586
Cayce, SC	595	111	25.9	457
Seguin, TX	739	136	33.5	569

Table 20: Facility-specific GWP100 results for 1 short ton of merchant bar

GWP 100 (kg CO_2 eq)	Total (A1-A3)	A1	A2	A3
Birmingham, AL	754	84.8	20.3	649
Magnolia, AR	737	127	78.7	532
Cayce, SC	540	101	23.5	414
Seguin, TX	670	123	30.4	516

Light Structural Shapes Results

Table 21: Resource use for 1 metric ton of light structural shapes

Indicator	Unit	Total (A1-A3)	A1	A2	A3
RPR_E	MJ LHV	533	60.5	20.2	452
RPR_M	MJ LHV	-	-	-	-
$NRPR_E$	MJ LHV	8,070	979	493	6,600
$NRPR_M$	MJ LHV	491	-	-	491
SM	kg	1,120	1,110	-	11.9
RSF	MJ LHV	-	-	-	-
NRSF	MJ LHV	-	-	-	-
RE	MJ LHV	-	-	-	-
FW	m^3	2.36	0.684	0.0899	1.59

Table 22: Resource use for 1 short ton of light structural shapes

Indicator	Unit	Total (A1-A3)	A1	A2	A3
RPR_E	MJ LHV	483	54.9	18.3	410
RPR_M	MJ LHV	-	-	-	-
$NRPR_E$	MJ LHV	7,320	888	447	5,990
$NRPR_M$	MJ LHV	445	-	-	445
SM	kg	1,020	1,010	-	10.8
RSF	MJ LHV	-	-	-	-
NRSF	MJ LHV	-	-	-	-
RE	MJ LHV	-	-	-	-
FW	m^3	2.14	0.62	0.0815	1.44

Table 23: Wastes and outputs for 1 metric ton of light structural shapes

Indicator	Unit	Total (A1-A3)	A1	A2	A3
HWD	kg	0.512	-	-	0.512
NHWD	kg	7.03	-	-	7.03
HLRW	kg	0.000599	0.0000183	1.31E-06	0.000579
ILLRW	kg	0.501	0.0159	0.00109	0.484
CRU	kg	-	-	-	-
MR	kg	127	-	-	127
MER	kg	-	-	-	-
EE	MJ LHV	0.0344	-	-	0.0344

Table 24: Wastes and outputs for 1 short ton of light structural shapes

Indicator	Unit	Total (A1-A3)	A1	A2	A3
HWD	kg	0.464	-	-	0.464
NHWD	kg	6.38	-	-	6.38
HLRW	kg	0.000543	0.0000166	1.19E-06	0.000525
ILLRW	kg	0.454	0.0144	0.000989	0.439
CRU	kg	-	-	-	-
MR	kg	115	-	-	115
MER	kg	-	-	-	-
EE	MJ LHV	0.0312	-	-	0.0312

Table 25: Impact assessment results for 1 metric ton of light structural shapes

Indicator	Unit	Total (A1-A3)	A1	A2	A3
GWP 100	kg CO_2 eq	754	98.1	33.6	622
ODP	kg CFC-11 eq	1.52E-10	1.51E-10	4.47E-15	5.58E-13
AP	kg SO_2 eq	1.48	0.595	0.236	0.644
EP	kg N eq	0.0794	0.013	0.0191	0.0473
SFP	kg O_3 eq	25.2	6.32	6.37	12.5
ADP_{fossil}	MJ	677	28.3	65.8	583

Table 26: Impact assessment results for 1 short ton of light structural shapes

Indicator	Unit	Total (A1-A3)	A1	A2	A3
GWP 100	kg CO_2 eq	684	89	30.5	564
ODP	kg CFC-11 eq	1.38E-10	1.37E-10	4.05E-15	5.06E-13
AP	kg SO_2 eq	1.34	0.54	0.214	0.584
EP	kg N eq	0.0720	0.0118	0.0173	0.0429
SFP	kg O_3 eq	22.9	5.73	5.78	11.3
ADP_{fossil}	MJ	614	25.7	59.7	529

To align with the PCR, "product specific EPDs which include averaging shall report the range of results for all TRACI indicators for products included in the average."

Table 27: Range of impact assessment results for 1 metric ton of light structural shapes

Indicator	Unit	A1-A3 (min)	A1-A3 (max)
GWP 100	kg CO_2 eq	594	849
ODP	kg CFC-11 eq	1.27E-10	1.68E-10
AP	kg SO_2 eq	1.12	1.56
EP	kg N eq	0.051	0.0879
SFP	kg O_3 eq	16.7	27.8
ADP_{fossil}	MJ	437	996

Table 28: Range of impact assessment results for 1 short ton of light structural shapes

Indicator	Unit	A1-A3 (min)	A1-A3 (max)
GWP 100	kg CO_2 eq	539	770
ODP	kg CFC-11 eq	1.15E-10	1.52E-10
AP	kg SO_2 eq	1.02	1.41
EP	kg N eq	0.0463	0.0797
SFP	kg O_3 eq	15.1	25.2
ADP_{fossil}	MJ	396	903

To support the reporting of mill-specific GWP100 results, Table 29 and Table 30 present GWP100 results by site.

Table 29: Facility-specific GWP100 results for 1 metric ton of light structural shapes

GWP 100 (kg CO_2 eq)	Total (A1-A3)	A1	A2	A3
Birmingham, AL	849	93.5	22.4	733
Magnolia, AR	842	88	86	668
Cayce, SC	594	111	25.9	457
Seguin, TX	671	85.5	32.7	553

Table 30: Facility-specific GWP100 results for 1 short ton of light structural shapes

GWP 100 (kg Co_2 eq)	Total (A1-A3)	A1	A2	A3
Birmingham, AL	770	84.8	20.3	665
Magnolia, AR	764	79.8	78	606
Cayce, SC	539	101	23.5	414
Seguin, TX	609	77.5	29.7	502

Interpretation

Environmental impacts for merchant bar/light structural steel production are driven by 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 ADP_{fossil}. ODP is driven by use of ferrocolumbium as an alloying element.

Figure 2. Relative results by category, merchant bar

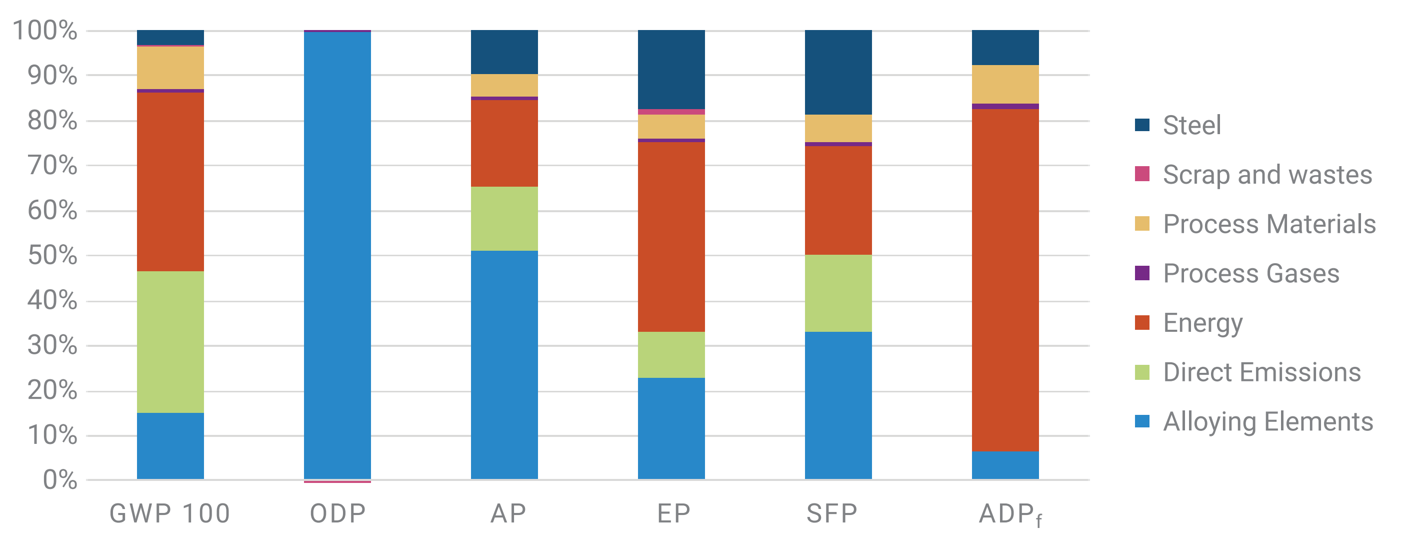
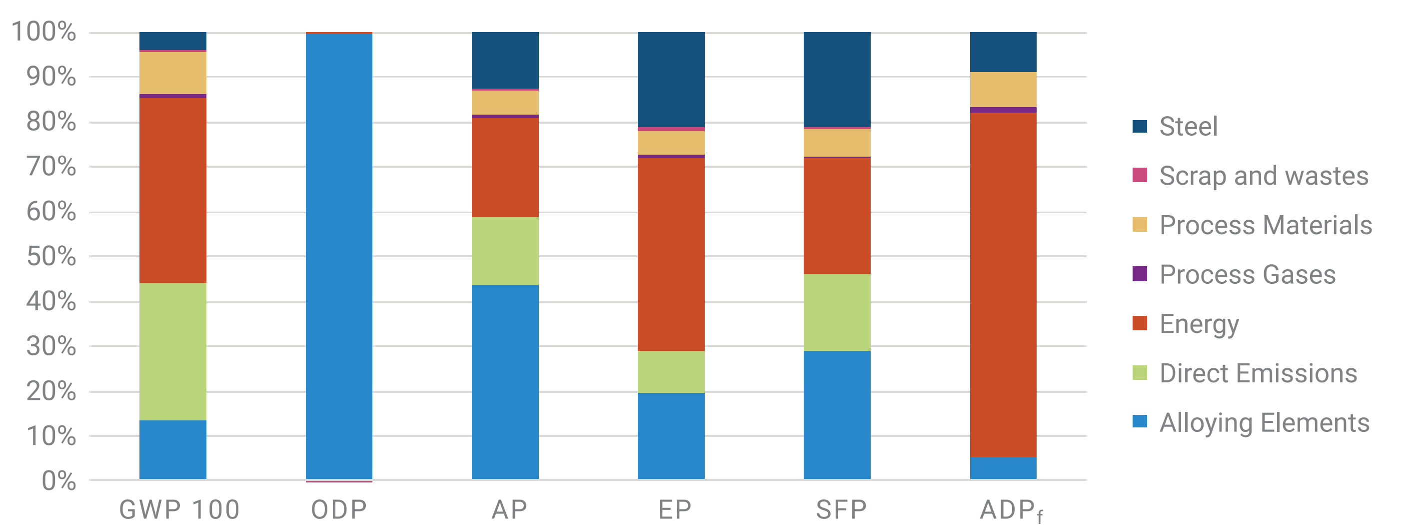


Figure 3. Relative results by category, light structural shapes



Additional Environmental Information

The products do not contain any hazardous substances according to the Resource Conservation and Recovery Act, 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.

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