MPI
CUSTOM STEEL DOORS & FRAMES

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner

MPI KY, LLC
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Product Group
5-3/4" (146 mm) 16-gauge steel door frame conforming to ANSI/SDI A250.8-2023. The product includes a prime painted finish conforming to ANSI A250.10.

Declared Unit
The declared unit is one steel door frame, manufactured in Corbin, KY

EPD Number and Period of Validity
SCS-EPD-10118
EPD Valid May 1, 2024 through April 30, 2029

Product Category Rule
PCR Guidance for Version 4. UL Environment. March 2022.

Product Category Rule (PCR) Guidance for Building-Related Products and Services: Commercial Steel Doors and Steel Frames EPD Requirements, UL 10010-27. Version: September 1, 2020.

Program Operator
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SCSglobal SERVICES

Declaration owner:	MPI KY, LLC
Address:	319 N. Hills Road Corbin, Kentucky 40701
Declaration Number:	SCS-EPD-10118
Declaration Validity Period:	EPD Valid May 1, 2024 through April 30, 2029
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Tess Garvey, Ph.D., SCS Global Services
LCA Software and LCI database:	OpenLCA 2.0 software and the Ecoinvent v3.9.1 database
Product's Intended Application:	The final product is designed and intended to be used for commercial applications.
Product RSL:	n/a
Markets of Applicability:	Global
EPD Type:	Manufacturer-specific
EPD Scope:	Cradle-to-Gate
LCIA Method and Version:	IPCC AR5 and TRACI 2.1
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Part A Product Category Rule:	PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 4. UL Environment. March 2022
Part A PCR Review conducted by:	Lindita Bushi, PhD (Chair); Hugues Imbeault-Tétreault, ing., M.Sc.A.; Jack Geibig
Part B Product Category Rule:	PCR Guidance for Building-Related Products and Services. Part B: Commercial Steel Doors and Steel Frames EPD Requirements. UL Environment. September 2020.
Part B PCR Review conducted by:	Lindita Bushi, PhD; Tim Weller; Dan Glover
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *When comparing EPDs created using this PCR, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

1. About MPI

Founded in 1980, MPI has become a leading manufacturer of custom steel doors, frames and accessories. The company's modern production facilities of more than 55,000 square feet are located in Corbin, KY, USA adjacent to the main offices. Facilities include an advanced Amada Fabrication Center housing automated punching and forming equipment.

MPI produces custom steel doors and frames for distribution nationally and internationally. As an active member of the Steel Door Institute (SDI) and the National Association of Architectural Metal Manufacturers (NAAMM), MPI adheres to the manufacturing specifications established by the SDI and the Hollow Metal Manufacturers Association (HMMA) division of NAAMM. Products meet or exceed requirements of specification standards ANSI A250.8 and ANSI A250.4. MPI offers a wide range of doors and frames in various thicknesses ranging from .042 to .093 steel. Products are manufactured from highest quality commercial grade steel in cold-rolled, A60 galvanneal or G90 galvanneal.

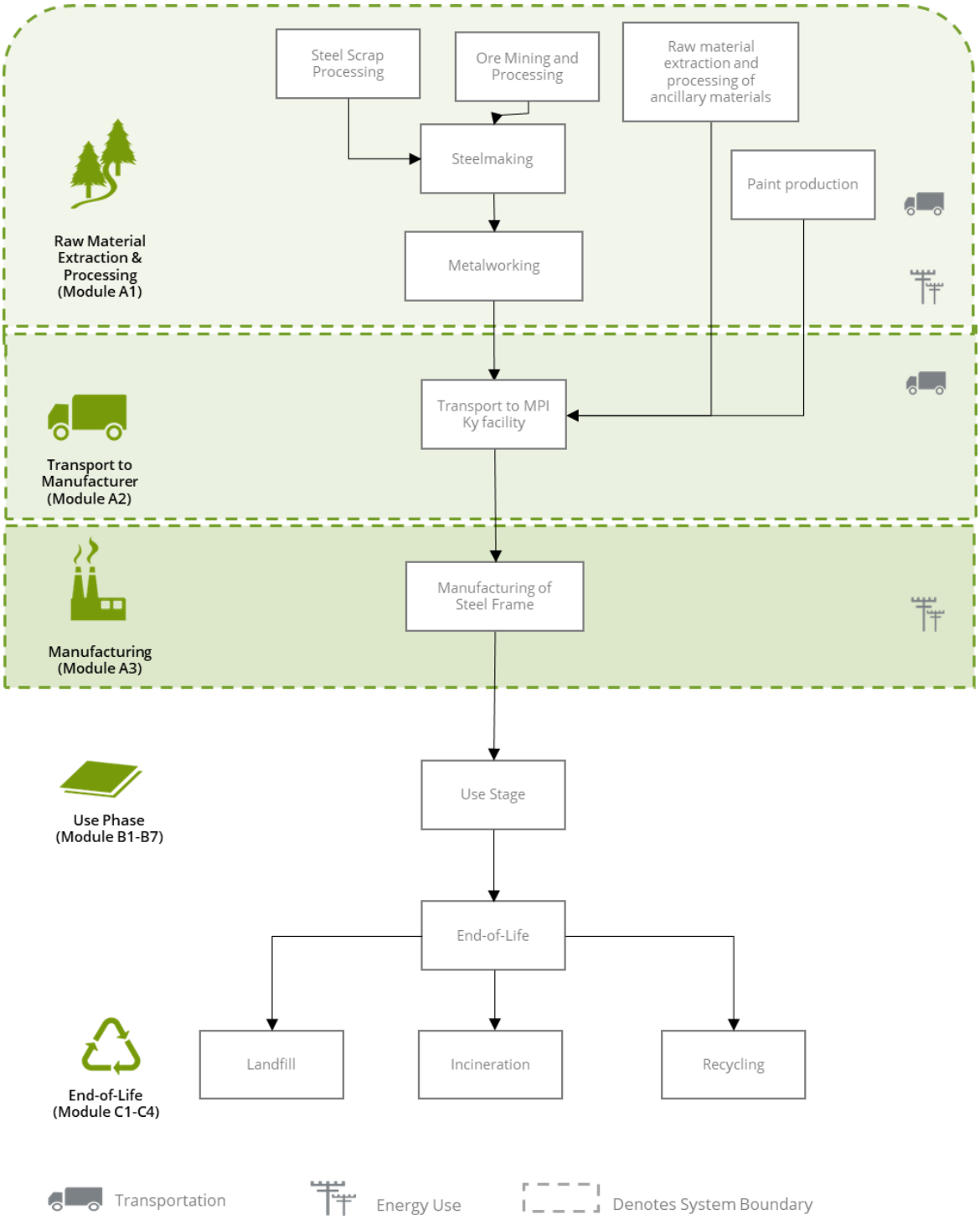
Quality and excellence in all phases of operation have brought MPI the recognition as a leading manufacturer of custom doors and frames. Custom means every door and frame is carefully hand-crafted to exact specifications. We do not pull components from a shelf, modify them and ship to a jobsite. When MPI says "custom", it means fully custom manufactured.

2. PRODUCT INFORMATION

2.1 PRODUCT DESCRIPTION

The commercial steel frame in this LCA study is based on a 5-3/4" (146 mm) 16-gauge steel frame conforming to ANSI/SDI A250.8-2023. The final commercial steel frame includes a prime painted finish conforming to ANSI A250.10. Hardware, such as hinges, are not included.

2.2 PRODUCT FLOW DIAGRAM



2.3 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-gate, including raw material extraction and processing, transportation steel manufacture, cold rolling, and coating, transportation from the upstream steel supplier to each facility, and manufacture within the facility. The life cycle phases included in the product system boundary are shown below.

Table 1. *Life cycle phases included in the Steel Frame product system boundary.*

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B1	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X = Module Included | MND = Module Not Declared

Cut-off and allocation procedures are described below and conform to the PCR and ISO standards.

2.4 TECHNICAL DATA

The technical specifications for the product in this EPD are listed below.

- ANSI/SDI A250.8-2023
- Includes a prime painted finish conforming to ANSI A250.10.
- Steady-state thermal transmittance and performance rating based on SDI-113-13 Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door and Frame Assemblies
- Air Leakage rate based on ANSI/UL 1784-2001 Air Leakage Test of Door Assemblies
- Indoor-outdoor sound attenuation according to ASTM E1332 Standard Classification for Rating Outdoor-Indoor Sound Attenuation
- Deflection/loading based on ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference

2.5 INTENDED APPLICATION

The final product is designed and intended to be used for commercial applications.

2.6 MATERIAL COMPOSITION

The material composition and recycled content of the product and its packaging are presented in Table 2. Values are rounded to three significant figures.

Table 2. *Material composition of one commercial steel frame of nominal dimensions of 3-ft by 7-ft considered in isolation, including packaging, manufactured by MPI.*

Material	Value	Percent of total
Steel	16.3	90%
Prime Paint	1.75	10%
Total	**18.1**	**100%**

No substances required to be reported as hazardous are associated with the production of this product.

2.7 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The final product is delivered to customer as a 5-3/4" (146 mm) 16-gauge steel frame conforming to ANSI/SDI A250.8-2023.

2.8 MANUFACTURING

Once steel sheet or coil is delivered to the manufacturing facility, it is sheared (die cut), punctured, and press-braked (bent) in preparation for the welding stage. Reinforcement steel parts are welded into place before being sent for washing to remove oils and other contaminants in preparation for prime painting. The frame is then coated with prime painting and the finish is cured. The final product is then packaged for shipping.

2.9 FURTHER INFORMATION

Further information on the product covered by this EPD can be found on at the manufacturer's website: https://www.mpiky.com

3. LIFE CYCLE ASSESSMENT

3.1 DECLARED UNIT

The declared unit is defined as one commercial steel door frame of nominal dimensions of 3-feet by 7-feet (0.91 m by 2.1 m) considered in isolation. The product includes a prime painted finish conforming to ANSI A250.10. The final product produced by MPI, including packaging, is 18.1 kg.

3.2 SYSTEM BOUNDARY

This LCA study is cradle-to-gate, which includes raw material supply (A1), transport (A2), and manufacturing (A3). The benefits and loads beyond the system boundary for reuse, recovery, and recycling potential (module D) are not included in this study. The cradle-to-gate boundary includes all unit processes contributing measurably to the category indicator results. Elements that are excluded from each system's boundary include the following:

- Construction activities, capital equipment, and infrastructure;
- Maintenance and operation of capital equipment; and
- Personnel travel and resource use.

The deletion of these processes and inputs is permitted since it is not expected to significantly change the overall conclusions of the study.

Table 3. *The modules and unit processes included in the scope for the Steel Frame product system.*

Module	Module Description	Unit Processes Included in Scope
A1	Raw material supply	Raw material extraction and processing, including but not limited to the recovery or extraction and processing of feedstock materials and including all activities necessary for the reprocessing steel scrap. Transportation to the melt shop. Steelmaking, casting, cold rolling, and coating. Raw material and processing of all other product components and ancillary materials.
A2	Transport (to the manufacturer)	Transportation of upstream materials, including steel and paint to the MPI facility
A3	Manufacturing, including packaging production	Steel frame manufacture at the MPI facility
A4	Transport (to the building site)	Module Not Declared
A5	Construction-installation process	Module Not Declared
B1	Product use	Module Not Declared
B2	Product maintenance	Module Not Declared
B3	Product repair	Module Not Declared
B4	Product replacement	Module Not Declared
B5	Product refurbishment	Module Not Declared
B6	Operational energy use by technical building systems	Module Not Declared
B7	Operational water uses by technical building systems	Module Not Declared
C1	Deconstruction, demolition	Module Not Declared
C2	Transport (to waste processing)	Module Not Declared
C3	Waste processing for reuse, recovery and/or recycling	Module Not Declared
C4	Disposal	Module Not Declared
D	Reuse-recovery-recycling potential	Module Not Declared

3.3 ALLOCATION

This study follows the allocation guidelines of ISO 14044 and allocation rules specified in the PCR and minimized the use of allocation wherever possible.

Mass allocation was deemed the most accurate and reproducible way of calculating the energy and material requirements for the manufacture of the steel frames. Primary data for resource use (e.g., electricity, natural gas, water), waste/byproducts, and emissions released, are allocated on a mass-basis as a fraction of total annual production.

The transportation from primary producer of material components to the facilities are based on primary data provided by the manufacturer, including modes, distances, and amount of material transported. Transportation was allocated on the basis of the mass and distance the material was transported.

3.4 CUT-OFF CRITERIA

All known materials and processed were included in the inventory. The cut-off criteria for including or excluding materials, energy, and emissions data are in accordance with the PCR and are listed below.

- Mass and energy flows that consist of less than 1% may be omitted from a unit process
- Cumulative omitted mass or energy flows shall not exceed 5%

3.5 DATA SOURCES

Table 4. *LCI datasets and associated databases used to model the steel frame product system for MPI.*

Flow	Dataset	Data Source	Publication Date
Steel Door Materials			
HDG Steel	LCI for HDG taken from AISI report	AISI report	2021
	Ecoinvent datasets to build LCI of steel: steel production, electric, low-alloyed | Cutoff, U - Europe without Switzerland and Austria * modified for egrid subregion (RFCW, SRTV, CAMX) steel production, converter, low-alloyed | Cutoff, U – RER* modified for eGRID subregion hot rolling, steel | Cutoff, U - Europe without Austria market group for electricity, medium voltage | Cutoff, U – US market for natural gas, high pressure | Cutoff, U – US market for hydrochloric acid, without water, in 30% solution state | Cutoff, U - RER market for nitrogen, liquid | Cutoff, U – RER market for zinc | Cutoff, U – GLO process-specific burdens, hazardous waste incineration plant |Cutoff, U - RoW	Ecoinvent 3.9.1	2022
Primer	Modeled based upon SDS sheets provided by manufacturer	Ecoinvent 3.9.1	2022
Packaging Materials			
Strapping	polyethylene production, low density, granulate | Cutoff, U - RER	Ecoinvent 3.9.1	2022
Resource Use			
Electricity	market for electricity, medium voltage | Cutoff, U	Ecoinvent 3.9.1	2022
	modified for respective eGRID subregions	eGRID 2021	2023
Propane	propane, burned in building machine | Cutoff, U - GLO	Ecoinvent 3.9.1	2022
Water	market for tap water | Cutoff, U - Europe without Switzerland	Ecoinvent 3.9.1	2022
Gases	market for argon, liquid | Cutoff, U – RER market for carbon dioxide, liquid | Cutoff, U – RER market for oxygen, liquid | Cutoff, U - RER		
Manufacturing wastes	treatment of waste paint, hazardous waste incineration | Cutoff, U - Europe without Switzerland process-specific burdens, municipal waste incineration | Cutoff, U - Europe without Switzerland process-specific burdens, inert material landfill | Cutoff, U – RoW treatment of spent solvent mixture, hazardous waste incineration | Cutoff, U - Europe without Switzerland	Ecoinvent 3.9.1	2022
Transportation			
Truck transport	transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RER	Ecoinvent 3.9.1	2022

3.6 DATA QUALITY

The data quality assessment addressed the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

Table 5. *Data Quality Assessment.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 10 years old. All of the manufacturer-supplied data used represented an average of at least one year's worth of data collection.
Geographical Coverage Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Actual processes for upstream operations are primarily North American. Surrogate data used in the assessment are representative of North American operations. Data representative of European operations are considered sufficiently similar to actual processes. Data representing disposal practices are based on regional statistics.
Technology Coverage Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations.
Precision Measure of the variability of the data values for each data expressed (e.g. variance)	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the steel doors and frames. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness Qualitative assessment of the degree to which the data set reflects the true population of interest (i.e. geographical coverage, time period and technology coverage)	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction. For supplier information, the most representative source of data possible was chosen or modeled.
Consistency Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used with a bias towards Ecoinvent v3.9.1 data. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current average practices in Europe and North America.
Reproducibility Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners with access to the primary data. All assumptions, models, and data sources are documented.
Sources of the Data Description of all primary and secondary data sources	Data representing energy use at the manufacturing facilities represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. The Ecoinvent database is used for secondary LCI datasets.
Uncertainty of the Information Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the steel doors and frames is low. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.7 PERIOD UNDER REVIEW

The year of data supplied represents an entire year of operation, from January 1, 2022 through December 31, 2022.

3.8 TREATMENT OF BIOGENIC CARBON

No biogenic carbon is contained within the product system, including packaging.

3.9 COMPARABILITY

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, and therefore EPDs may not be used for comparability purposes when not considering the construction works energy use phase as instructed under this PCR.

3.10 ESTIMATES AND ASSUMPTIONS

The assessment relied on several assumptions, described below.

- Life cycle inventory for hot dipped galvanized (HDG) and cold rolled steel were modeled based on data in the 2021 AISI LCA report[1].
- MPI supplied the names of their steel suppliers and recycled content thereof. Steel purchased from distributors were modeled using the US average. Steel purchased from mills were modeled using the appropriate electric arc furnace (EAF) or basic oxygen furnace (BOF) datasets in ecoinvent with the electricity dataset tailored to the appropriate eGRID NERC subregion, RFCW and SRTV.
- Representative inventory data for other raw materials were modeled with unit process data taken from Ecoinvent.
- Representative inventory data for electricity use at the participating facilities were modified to reflect the eGRID subregion electricity supply mixes at the each of the manufacturing facilities.
- Transportation for manufacturing wastes were modeled using the EPA WARM model assumption of 20 miles (~32 km), from the point of product use to a landfill, material recovery center, or waste incinerator. Ecoinvent datasets are used to model the impacts associated with incineration and landfilling, which does not include energy recovery from landfill gas.

3.11 UNITS

All data and results are presented using SI units.

[1] sphera on behalf of AISI. 2020. Life Cycle Inventories of North American Steel Products.

4. LCA RESULTS

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The following environmental impact category indicators are reported using characterization factors based on the U.S. EPA's Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts – TRACI 2.1.

TRACI 2.1 Impact Category	Unit
Global Warming Potential **(GWP)***	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
Fossil Fuel Depletion **(FFD)**	MJ Surplus, LHV

*TRACI 2.1 is based on IPCC AR4. Due to data available results presented in this EPD for the GWP indicator are based on IPCC AR5.

These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

The following inventory parameters, specified by the PCR, are also reported.

Resources	Unit	Waste and Outflows	Unit
RPR_E: Renewable primary resources used as energy carrier (fuel)	MJ, LHV	**HWD:** Hazardous waste disposed	kg
RPR_M: Renewable primary resources with energy content used as material	MJ, LHV	**NHWD:** Non-hazardous waste disposed	kg
$NRPR_E$: Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	**HLRW:** High-level radioactive waste, conditioned, to final repository	kg
$NRPR_M$: Non-renewable primary resources with energy content used as material	MJ, LHV	**ILLRW:** Intermediate- and low-level radioactive waste, conditioned, to final repository	kg
SM: Secondary materials	MJ, LHV	**CRU:** Components for re-use	kg
RSF: Renewable secondary fuels	MJ, LHV	**MR:** Materials for recycling	kg
NRSF: Non-renewable secondary fuels	MJ, LHV	**MER:** Materials for energy recovery	kg
RE: Recovered energy	MJ, LHV	**EE:** Recovered energy exported from the product system	MJ, LHV
FW: Use of net freshwater resources	m^3	-	-

Table 6. *IPCC AR5 and TRACI 2.1 LCIA results reported by life cycle module for one commercial steel frame of nominal dimensions of 3-ft by 7-ft considered in isolation, including packaging, manufactured by MPI.*

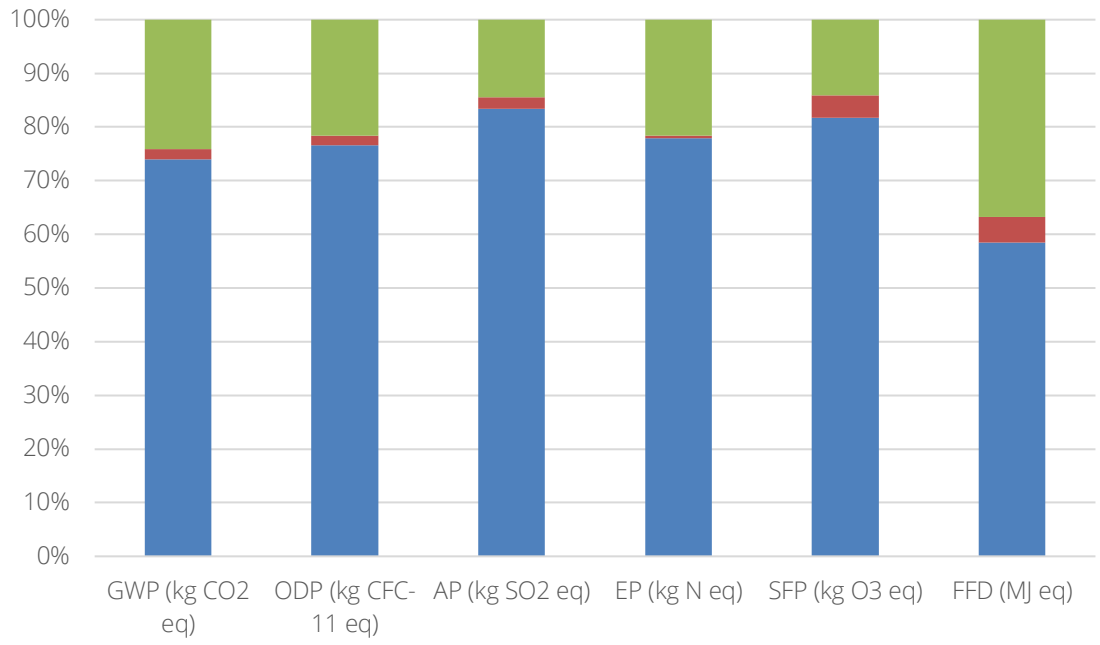
Impact Category	Life cycle stage			
	A1	A2	A3	Total
CML-IA (IPCC AR5)				
GWP (kg CO_2 eq)	48.5	1.27	15.8	65.6
	74%	2%	24%	100%
TRACI 2.1				
GWP (kg CO_2 eq)	48.1	1.25	15.7	65.1
	74%	2%	24%	100%
ODP (kg CFC-11 eq)	$1.29x10^{-6}$	$3.00x10^{-8}$	$3.65x10^{-7}$	$1.68x10^{-6}$
	77%	2%	22%	100%
AP (kg SO_2 eq)	0.178	$4.56x10^{-3}$	$3.10x10^{-2}$	0.213
	83%	2%	15%	100%
EP (kg N eq)	0.189	$1.06x10^{-3}$	$5.25x10^{-2}$	0.242
	78%	0%	22%	100%
SFP (kg O_3 eq)	2.44	0.122	0.422	2.98
	82%	4%	14%	100%
FFD (MJ Surplus)	31.5	2.58	19.7	53.8
	59%	5%	37%	100%

Table 7. *Resource use and waste flows for one commercial steel frame, including percent contribution by life cycle stage. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Parameter	Steel Frame			
	A1	A2	A3	Total (A1-A3)
Resources				
RPRE (MJ)	52.9	0.282	11.2	64.4
	82%	0%	17%	100%
RPRM (MJ)	0	0	0	0
	n/a	n/a	n/a	n/a
NRPRE (MJ)	529	18.2	270	817
	65%	2%	33%	100%
NRPRM (MJ)	14.1	0	0	14.1
	100%	0%	0%	100%
SM (kg)	15.6	0	0	15.6
	100%	0%	0%	100%
RSF/NRSF (MJ)	0	0	0	0
RE (MJ)	0	0	0	0
FW (m^3)	0.508	$2.26x10^{-3}$	$7.84 x10^{-2}$	0.589
	86%	0%	13%	100%
Wastes				
NHWD (kg)	n/a	n/a	0.306	0.306
	n/a	n/a	100%	100%
HWD (kg)	n/a	n/a	0.0	0.0
HLRW (kg)	n/a	n/a	0.0	0.0
ILLRW (kg)	n/a	n/a	0.0	0.0
CRU (kg)	n/a	n/a	0.0	0.0
MR (kg)	n/a	n/a	0.0	0.0
MER (kg)	n/a	n/a	0.0	0.0
EE (MJ)	n/a	n/a	0.0	0.0

5. LCA: Interpretation

The contributions to total impact indicator results are dominated by the upstream steelmaking and hot rolling (A1), followed by manufacture of the steel frames (A3).



Limitations

As a result of the choice of study scope and LCIA methodologies used, there are several important study limitations which should be understood to ensure an appropriate interpretation of results, as described below.

Limitations in the Study Scope

Primary data of material components could not be modeled with actual process information. Secondary data consists of ecoinvent datasets and impact results taken from the supplier EPDs.

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.

The results presented should be considered in the context of operational impacts from the function of the integrated whole building system. When the building lifetime is taken into account, the impacts resulting from the production of these steel products can range from small, to significant, due to the nearly limitless number of building designs possible. These impacts from the operational phase of a whole building are not the subject of this study but should be considered when interpreting results.

It should also be noted that LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Limitations in Results for Other Parameters

The PCR requires that results for several inventory flows related to construction products are to be reported as "other parameters". These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted taking into account this limitation.

6. REFERENCES

1. American National Standards Institute (ANSI), 1899 L Street, NW, 11th Floor, Washington, DC 20036, www.ansi.org
2. ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA, 19428-2959 USA. http://www.astm.org/Standard/index.shtml
3. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
4. ISO 14040: 2006/Amd1:2020/Environmental management – Life cycle assessment – Principles and framework
5. ISO 14044:2006/Amd1:2017/Amd2:2020 Environmental Management – Life cycle assessment – Requirements and Guidelines
6. ISO 21930: 2017 Sustainability in building construction – Environmental declaration of building products.
7. Life Cycle Assessment of Commercial Steel Doors and Steel Frames. Prepared for Steel Door Institute. SCS Global Services Draft Report, November 2023.
8. PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 4. UL Environment, March 2022.
9. PCR Guidance for Building-Related Products and Services Part B: Commercial Steel Doors and Steel Frames EPD Requirements, UL 10010-27. Version: September 1, 2020
10. SCS Type III Environmental Declaration Program: Program Operator Manual. V12.0 December 2023. SCS Global Services.
11. Steel Door Institute (SDI), 30200 Detroit Road, Westlake, Ohio 44145, https://www.steeldoor.org/ansi.php; https://www.steeldoor.org/tech_data.php
12. Ryberg, M., M. Vieira, M. Zgola, J. Bare, AND R. Rosenbaum. Updated US and Canadian Normalization Factors for TRACI 2.1. CLEAN TECHNOLOGIES ENVIRONMENTAL POLICY. Springer, New York, NY, 16(2):329-339, (2014).
13. Ecoinvent Centre (2022) ecoinvent data from v3.9.1. Swiss Center for Life Cycle Inventories, Dubendorf, 2022, http://www.ecoinvent.org.

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