Environmental Product Declaration | The MPI Group, LLC
16 Gauge Steel Frame

Declaration Owner
The MPI Group, LLC
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Product

5-3/4" (146 mm) 16 gauge steel door frame conforming to ANSI/SDI A250.8-2007 (R2011). The product includes a prime painted finish conforming to ANSI A250.10.

EPD Number and Period of Validity
SCS-EPD-05022
EPD Valid June 15, 2018 through June 14, 2023

Product Category Rule
Product Category Rule (PCR) for Preparing an Environmental Product Declaration (EPD) for Product Group: Commercial Steel Doors and/or Steel Frames UL 9005. Version: March 10, 2015

Program Operator
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Disclaimers: *This EPD conforms to ISO 14025, 14040, ISO 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: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

PCR review, was conducted by	The Independent Expert Committee, SVR
Approved Date: June, 15, 2018 – End Date: June 14, 2023	
Independent verification of the declaration and data, according to ISO 14025:2006	☐ internal ☑ external
Third party verifier	Tom Gloria, Ph.D., Industrial Ecology Consultants

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.

PRODUCT INFORMATION

Product description

The product in this Environmental Product Declaration (EPD) is a 5-3/4" (146 mm) 16 gauge steel frame conforming to ANSI/SDI A250.8-2007 (R2011). The final commercial steel frame includes a prime painted finish conforming to ANSI A250.10. Hardware, such as hinges or exit devices, are not included. The product in this EPD is based on a specific product as an average from the plants of seven manufacturers. In accordance with the PCR, the product in this EPD is based on a specific product manufactured at the MPI facility in Corbin, KY.

Product application

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

Product characterization

The final product is delivered to customer with installation instructions and/or manuals.

Technical information

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

- ANSI/SDI A250.8-2007 (R2011)
- 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

Product composition

The material composition and recycled content of the product are presented in Table 1. Non-consumable packaging materials are used for the final product and are excluded from the LCA. Values are rounded to three significant figures.

Table 1. *Material composition of one commercial three-sided frame that can fit a door with nominal dimensions of 3-ft by 7-ft.*

Product				
Material	Value (kg)	Percent of Total	Pre-Consumer (%)	Post-Consumer (%)
Steel	17.6	91.0%	30.4%	58.8%
Prime Paint	1.75	9.04%	0%	0%
Total	**19.4**	**100%**	**27.6%**	**53.5%**

Product manufacture

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.

Delivery status

The final product is delivered to customer as a 5-3/4" (146 mm) 16 gauge steel frame conforming to ANSI/SDI A250.8-2007 (R2011).

Product installation

Product installation shall conform to the instructions provided by the manufacturer and ANSI/SDI A250.11. Installation instruction are available on the MPI website: http://www.metalproductsinc.com/html/document_center.html

Environment and health during use

There are no environmental or health considerations during the use of the product.

End-of-Life

The scope of this EPD is cradle-to-gate and therefore excludes end-of-life.

Further information

Further information on the product covered by this EPD can be found on at:
http://www.metalproductsinc.com/html/doors_.html

LIFE CYCLE ASSESSMENT

Declared Unit

The declared unit is defined as a 5-3/4" (146 mm) 16 gauge steel frame conforming to ANSI/SDI A250.8-2007 (R2011). The final commercial steel frame includes a prime painted finish conforming to ANSI A250.10. The average final product, including packaging, is 19.4 kg.

System Boundary

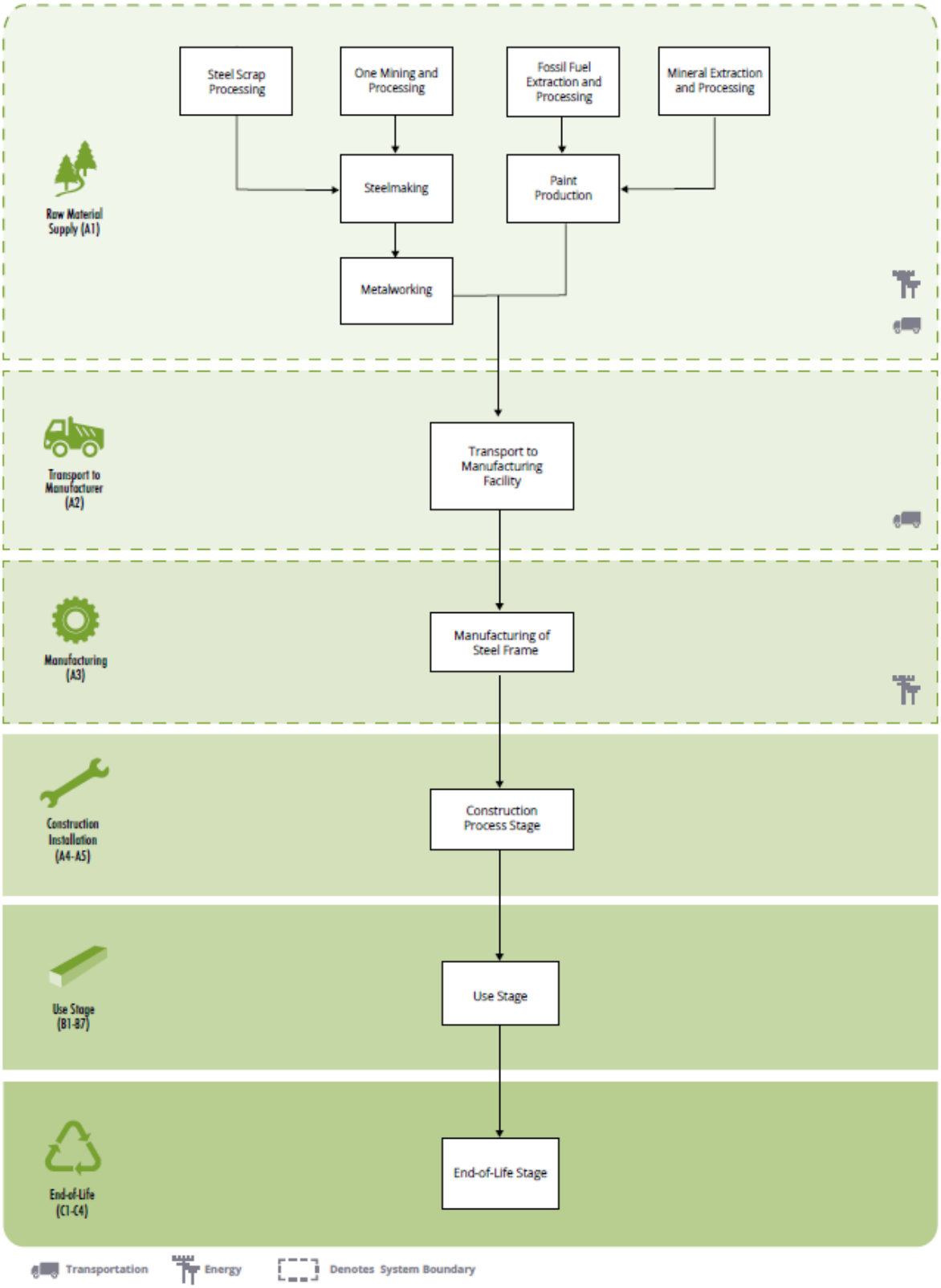
This LCA study is cradle-to-gate, which includes raw material supply (A1), transport (A2), and manufacturing (A3). The benefits and loads beyond the system boundary for reuse, recovery, and recycling potential (module D) are not included in this study. The cradle-to-gate boundary includes all unit processes 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. A general description of each life cycle stage, in accordance with the PCR, is provided below.

- ***Raw material supply (A1) –*** This stage includes extraction of virgin materials and reclamation of non-virgin feedstock. Resource use and emissions associated with both extraction of the raw materials, material processing, and product component manufacturing are included.
- ***Transport (A2) –***This stage is associated with the transport of the processed raw materials to the manufacturing facility and any internal transport.
- ***Manufacturing (A3) –*** This stage includes all the relevant manufacturing processes and flows, including the impacts from energy use and emissions at the facility. Production of capital goods, infrastructure, manufacturing equipment, and personnel-related activities are not included. The production of packaging and ancillary materials is included, as well as any waste for processing or disposal.

The diagram below is a representation of the most significant contributions to the product system.



Estimates and Assumptions

The assessment relied on several assumptions, described below.

- Representative inventory data from Ecoinvent v3.3 and eGRID2014 were used to reflect the energy mix for electricity use at the manufacturing facility.
- Life cycle inventory data were modeled with data taken from Ecoinvent v3.3.

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%

Background Data

Unit processes are developed with SimaPro v8.3 software. The following primary data were provided for modeling:

- Material types and amounts required for manufacturing and packaging, including scrap rate.
- MSDS for several material inputs used for manufacturing.
- Upstream transport of materials for manufacturing and packaging; specifically, modes and distances.
- Annual production, resource use (e.g., electricity, natural gas, water, etc.), waste, and emissions released at the manufacturing facility.

Secondary life cycle inventory data are taken from Ecoinvent v3.3 and eGRID2014.

Data Quality

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage Age of data and the minimum length of time over which data is collected	Manufacturing data are based on 2016 annual production. Representative datasets (secondary data) used for upstream and background processes are generally less than 5 years old. All primary 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. Representative data used in the assessment are representative of US, Global, or "Rest-of-World" (average for all countries in the world with uncertainty adjusted). Datasets chosen are considered sufficiently similar to actual geographical coverage of processes. Furthermore, regional information allowed for specific energy mixes for electricity use to be modeled.
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 year and over multiple operations, which is expected to reduce the variability of results.
Completeness Percentage of flow that is measured or estimated	Except where noted, the LCA model included all known mass and energy flows. In some instances, surrogate data used to represent upstream operations may be missing some data which is propagated in the model. No known processes or activities were excluded; in total, these missing data represent less than 5% of the cumulative omitted mass or energy flows.
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 primary data collection throughout the supply chain back to resource extraction. Some proxy datasets are used to represent material ingredients due to the lack of specific datasets available.
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, which are taken from Ecoinvent v3.3. Different portions of the product life cycle are equally considered.
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. All assumptions, models, and data sources are documented.
Sources of the Data Description of all primary and secondary data sources	The following primary data were provided: 1) material types and amounts required for manufacturing and packaging of the products under scope, including scrap rate; 2) MSDS for several material inputs used for manufacturing of the products under scope; 3) upstream transport of materials for manufacturing and packaging of the products under scope (modes and distances); 4) annual production, resource use, waste, and emissions released during manufacturing. Where primary upstream data were unavailable, secondary data were taken from Ecoinvent v3.3.
Uncertainty of the Information Uncertainty related to data, models, and assumptions	Uncertainty related to the product materials and packaging is low. Data for upstream operations relied upon use of existing representative datasets. These datasets contained relatively recent data (<5 years), but lacked specific geographical representativeness with the exception of a regionalized electricity grid when known. Uncertainty related to the impact assessment methods used in the study are high. The impact methods required by the PCR include impact potentials, which lack characterization of providing and receiving environments or tipping points.

Period under Consideration

The period of review is calendar year 2016.

Allocation

Manufacturing resource use and emissions were allocated to the product on a mass basis as a fraction of total annual production. The product includes recycled content, which are allocated using the recycled content allocation method, also known as the 100-0 cut off method. Impacts from transportation were allocated based on the mass of material and distance transported.

Comparability

The PCR this EPD is based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

LCA Results

The diagram below illustrates the life cycle stages included in this EPD.

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 supply	Transport	Manufacturing	Transport	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 = Included in system boundary; MND = Module not declared

The choice of categories and indicators used in the assessment are taken from the PCR. Impact category indicators are estimated using TRACI 2.1. All results are rounded to two significant digits.

Table 2. *List of impact categories, impact category acronyms, LCIA method, and units for reporting of results.*

Impact Category	Acronym	LCIA Method	Reporting Unit
Global Warming Potential	GWP	TRACI 2.1	Kilograms CO_2 eq
Acidification Potential	AP	TRACI 2.1	Kilograms SO_2 eq
Photochemical oxidant creation potential	POCP	TRACI 2.1	Kilograms O_3 eq
Eutrophication Potential	EP	TRACI 2.1	Kilograms N eq
Ozone Depletion Potential	ODP	TRACI 2.1	Kilograms CFC-11 eq
Fossil Fuel Depletion	FFD	TRACI 2.1	MJ surplus

Table 3. *LCIA results reported for one commercial three-sided frame that can fit a door with nominal dimensions of 3-ft by 7-ft.*

Module	GWP (kg CO_2 eq)	ODP (kg CFC-11 eq)	AP (kg SO_2 eq)	EP (kg N eq)	SP (kg O_3 eq)	FFD (MJ)
Total	33 100%	$1.9x10^{-6}$ 100%	0.19 100%	0.13 100%	1.8 100%	31 100%
A1	18 53%	$1.3x10^{-6}$ 65%	$9.4x10^{-2}$ 49%	$6.7x10^{-2}$ 54%	1.0 54%	20 62%
A2	1.1 3.4%	$2.1x10^{-7}$ 11%	$5.2x10^{-3}$ 2.7%	$1.3x10^{-3}$ 1.0%	0.12 6.6%	2.5 7.9%
A3	14 44%	$4.7x10^{-7}$ 24%	$9.1x10^{-2}$ 48%	$5.7x10^{-2}$ 45%	0.72 39%	9.3 30%

The key life cycle inventory data parameters are taken from the PCR, which include resource use, output flows, and waste categories. All results are rounded to two significant digits. Results reported in MJ are calculated using lower heating values. Results reported as *INA* represent "indicators not assessed".

Table 4. *List of key life cycle inventory parameters, parameter acronyms, and units for reporting of results.*

Key Life Cycle Inventory Parameter	Acronym	Reporting Unit
Renewable primary energy as energy carrier	PERE	Megajoules
Renewable primary energy resources as material utilization	PERM	Megajoules
Total use of renewable primary energy resources	PERT	Megajoules
Non-renewable primary energy as energy carrier	PENRE	Megajoules
Non-renewable primary energy as material utilization	PENRM	Megajoules
Total use of non-renewable primary energy resources	PENRT	Megajoules
Use of secondary material	SM	Kilograms
Use of renewable secondary fuels	RSF	Megajoules
Use of non-renewable secondary fuels	NRSF	Megajoules
Use of net fresh water	FW	Cubic meters
Hazardous waste disposed	HWD	Kilograms
Non-hazardous waste disposed	NHWD	Kilograms
Radioactive waste disposed	RWD	Kilograms
Components for re-use	CRU	Kilograms
Materials for recycling	MFR	Kilograms
Materials for energy recovery	MER	Kilograms
Exported electric energy	EEE	Megajoules
Exported thermal energy	EET	Megajoules

Table 5. *Resource use results for one commercial three-sided frame that can fit a door with nominal dimensions of 3-ft by 7-ft.*

Module	PERE (MJ)	PERM (MJ)	PERT (MJ)	PENRE (MJ)	PENRM (MJ)	PENRT (MJ)	SM (kg)	RSF (MJ)	NRSF (MJ)	FW (m^3)
Total	100	0.00	100	540	INA	540	16	INA	INA	1.7
A1	9.2	0.0	9.2	290	INA	290	0.0	INA	INA	1.2
A2	0.22	0.0	0.22	18	INA	18	0.0	INA	INA	$1.3x10^{-2}$
A3	92	0.00	92	230	INA	230	16	INA	INA	0.50

Table 6. *Waste and outflows for one commercial three-sided frame that can fit a door with nominal dimensions of 3-ft by 7-ft.*

Module	HWD (kg)	NHWD (kg)	RWD (kg)	CRU (kg)	MFR (kg)	MER (kg)	EEE (MJ)	EET (MJ)
Total	$9.4x10^{-4}$	5.9	$2.3x10^{-4}$	0.0	4.4	INA	INA	INA
A1	$5.9x10^{-4}$	4.2	$1.2x10^{-4}$	0.0	0.0	INA	INA	INA
A2	$1.0x10^{-5}$	0.81	$2.0x10^{-5}$	0.0	0.0	INA	INA	INA
A3	$3.4x10^{-4}$	0.85	$9.2x10^{-5}$	0.0	4.4	INA	INA	INA

LCA Interpretation

The interpretation phase conforms to ISO 14044 with further guidance from the International Reference Life Cycle Data System (ILCD) General Guide for Life Cycle Assessment. The interpretation included the use of evaluation and sensitivity checks to steer the iterative process during the assessment, and a final evaluation including completeness, sensitivity, and consistency checks, at the end of the study.

Generally, the contribution to environmental impacts from raw material extraction and processing (A1) is the largest, followed by product manufacturing (A3). The contribution to environmental impacts from the transport of raw materials to manufacturing facility (A2) is relatively small with respect to the other modules of the product stage.

REFERENCES

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