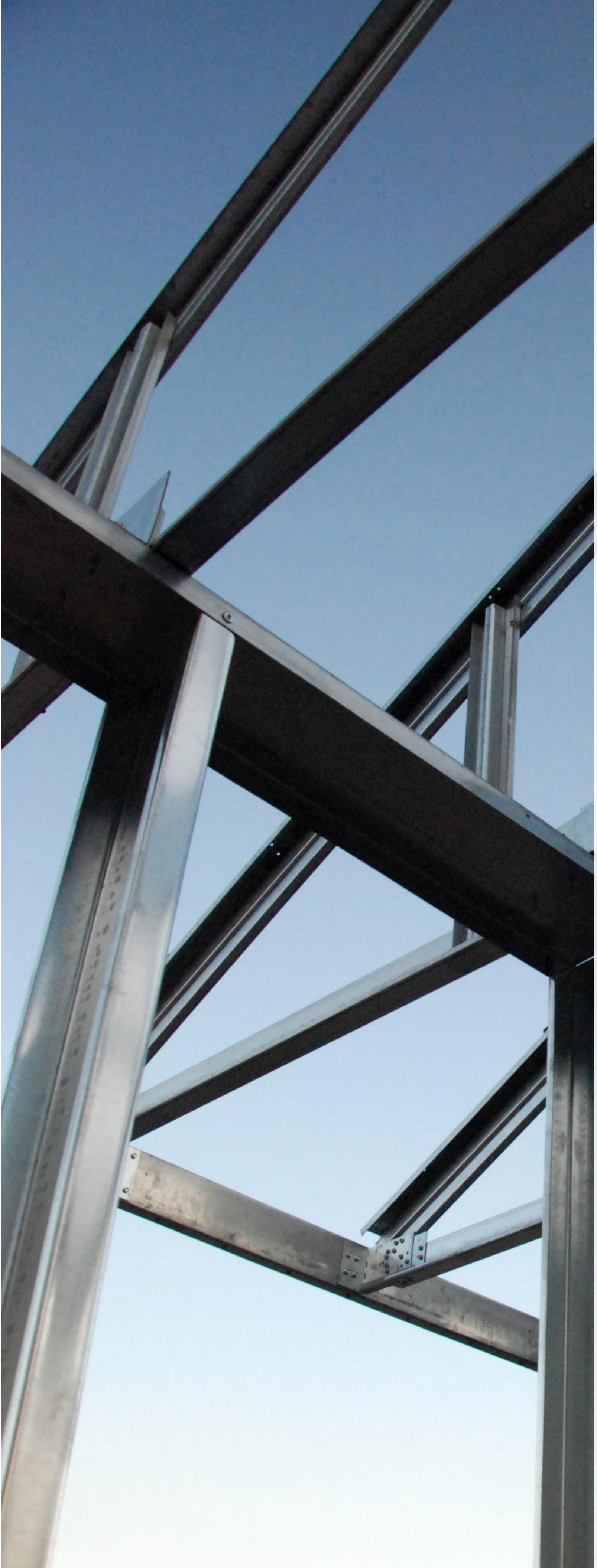


STEEL FRAMING INDUSTRY ASSOCIATION

Declaration Owner

Steel Framing Industry Association
513 W. Broad Street, Suite 210,
Falls Church, VA 22046
Phone: 703.538.1720
www.cfsteel.org

Product:
Cold-formed Steel Framing

Declared Unit
The declared unit is one ton of industry-averaged cold-formed steel framing product

EPD Number and Period of Validity
SCS-EPD-07103
EPD Valid May 28, 2021 through May 27, 2026

Product Category Rule
PCR Guidance for Version 3.2. Part A. UL Environment. Sept. 2018

PCR Guidance for Building-Related Products and Services. Part B: Designated Steel Construction Product EPD Requirements. UL Environment. v2. August 2020.

Program Operator

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
+1.510.452.8000 | www.SCSglobalServices.com

Declaration owner:	Steel Framing Industry Association
Address:	513 W. Broad Street, Suite 210, Falls Church, VA 22046
Declaration Number:	SCS-EPD-07103
Declaration Validity Period:	May 28, 2021 through May 27, 2026
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 1.10 software and the Ecoinvent v3.71 database
Product's Intended Application:	Cold Formed Steel Framing applications
Product RSL:	n/a
Markets of Applicability:	Global
EPD Type:	Industry-Wide
EPD Scope:	Cradle-to-Gate
LCIA Method and Version:	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 3.2. UL Environment. Sept. 2018
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: Designated Steel Construction Product EPD Requirements. UL Environment. August 2020.
Part B PCR Review conducted by:	Thomas Gloria, PhD; Brandie Sebastian, James Littlefield
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: *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.*

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. Steel Framing Industry Association

The Steel Framing Industry Association (SFIA) consists of manufacturers, designers, suppliers, and construction professionals committed to improving market conditions for and the quality of cold-formed steel in construction, and its members represent 80% of the cold-formed steel (CFS) framing products produced in the US. SFIA and its member companies pursue its goals through programs and initiatives that promote the use of cold-formed steel framing as a sustainable and cost-effective solution, advocate the development and acceptance of appropriate code provisions, educate members with reliable data and other critical information that is essential to effective business planning, and create a positive environment for innovation.

Recognized participants in the Industry Wide EPD include the following cold-formed steel framing product producers:

CEMCO® Expanding Your Solutions

ClarkDietrich®

Delineate, LLC.

FT FRAMETEK™

MILL STEEL FRAMING

MiTek®

MRI STEEL FRAMING LLC BUILDSMART.

PANEL REY® Drywall Solutions

RAM STEEL FRAMING SUPERIOR ROLL FORMING & STEEL MANUFACTURING

SBP State Building Products

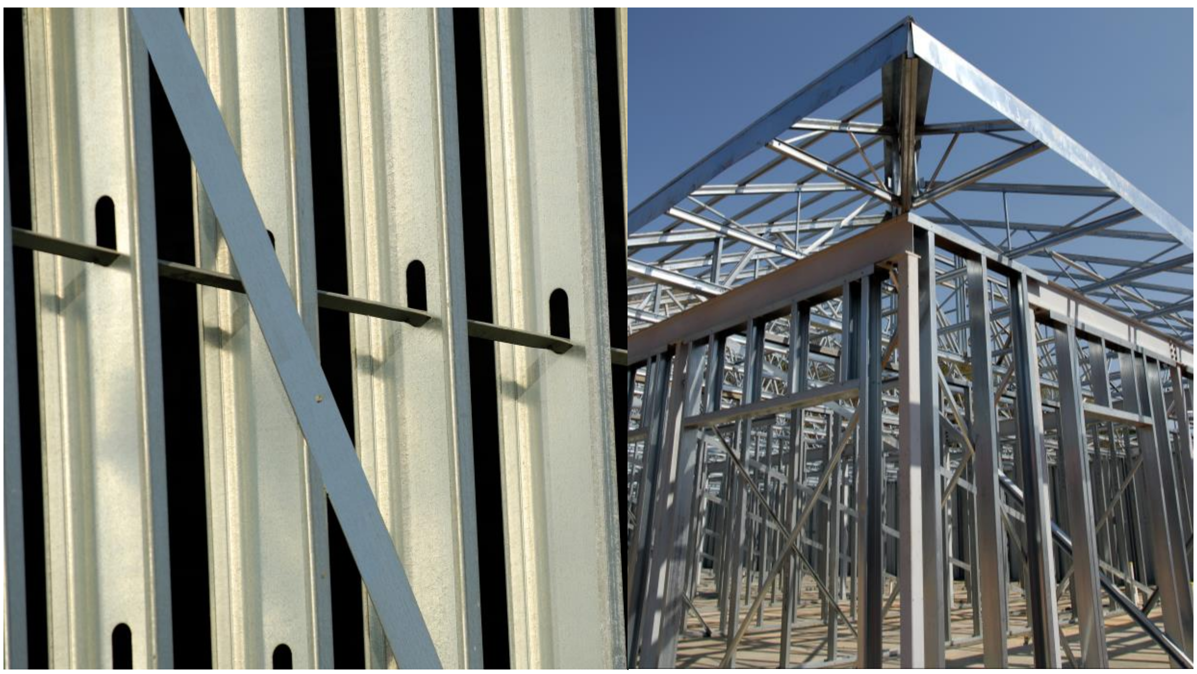
STEELER CONSTRUCTION SUPPLY

An open solicitation for participation in the formation of this EPD was performed by SFIA through to its membership. Eleven companies participated, with ten contributing data. One manufacturing facility was chosen from each company, and for companies with multiple facilities, locations were chosen in order to provide the greatest geographic and capacity representativeness across the US. Results in this EPD are based on a production-weighted average across the ten manufacturing sites.

2. Products

2.1 PRODUCT DESCRIPTION

The scope of products in this EPD includes structural and nonstructural framing components for walls, floors, ceilings, and roofs composed of hot-dipped galvanized cold-formed steel members and flat straps used for bracing. A non-exhaustive list of cold-formed steel members include C-shape studs, joists, rafters, or truss components; channel and furring; and angle or L-headers. These cold-formed steel framing products meet the requirements of AISI Standards S220 and S240. In addition, all products produced by the companies listed in this EPD and enrolled in the SFIA Code Compliance Certification Program are covered by this EPD. The hot dip galvanized steel sections used as an input material are produced in North America using a mix of both BOF (Basic Oxygen Furnace) and EAF (Electric Arc Furnace) steel making processes.



The cold-formed steel framing products have a density ranging from 7,769 to 7,849 kg/m^3.

2.2 PRODUCT FLOW DIAGRAM

A flow diagram illustrating the production processes and life cycle phases included in the scope of the EPD is provided below.

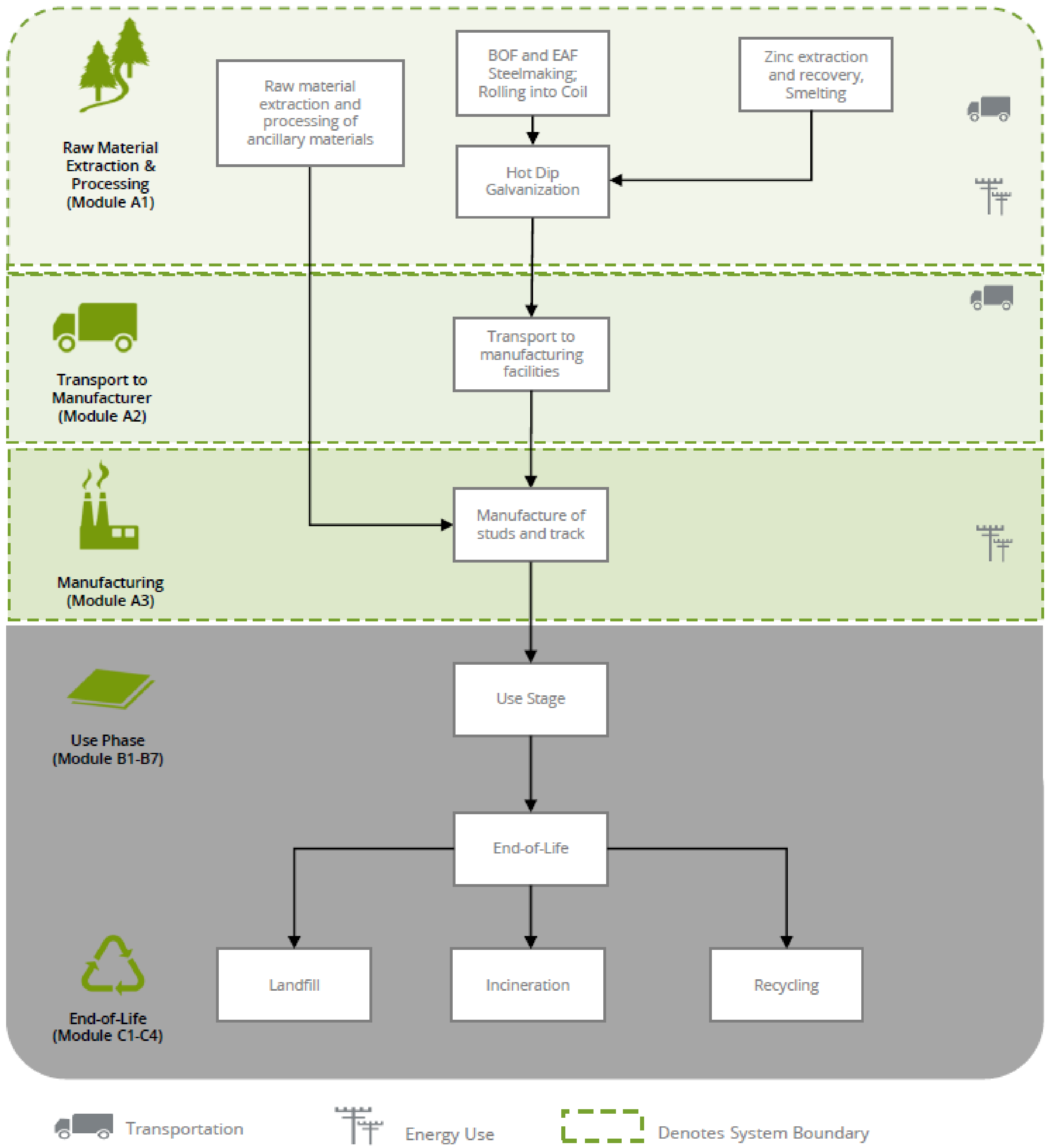


Figure 1. *Flow Diagram for the life cycle of the steel framing products*

2.4 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-gate, including raw material extraction and processing, transportation, steel manufacture and hot dip galvanization, transportation to manufacturing facilities, and steel framing products manufacture. The life cycle phases included in the product system boundary are shown below.

Table 1. *Life cycle phases included in the product system boundary for cold-formed steel framing products*

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.

2.5 TECHNICAL DATA

Technical specifications for the steel framing products include AISI Standards S220 and S240. These products comply with the SFIA Code Compliance Certification Program.

2.6 INTENDED APPLICATION

The intended use of products is for structural and non-structural framing of interior and exterior walls, roof, floors, and ceilings.

2.7 MATERIAL COMPOSITION

Based on the mass of steel from the LCI report for steelmaking (Sphera, 2020)[8] the hot dip galvanized (HDG) steel contains less than 1% of zinc and over 99% steel. No materials are added to the HDG steel during CFS framing products manufacture.

2.8 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The CFS framing products vary by manufacturer. The range in dimensions for the products are shown in the tables below.

Table 2. *Dimensions of Cold-Formed Steel C-Sections and Track included in the scope of the Industry Wide EPD.*

Cold-Formed Steel C-sections*	
Web Depth	1 5/8 to 16 inches (41.3 mm to 406 mm)
Flange Width	1 1/4 to 3 1/2 inches (31.8 to 88.9 mm)
Design Thickness	0.0188 to 0.1242 inches (0.478 to 3.155 mm)
Cold-Formed Steel Track (inside dimensions)	
Web Depth	1 5/8 to 16 inches (41.3 mm to 406 mm)
Flange Width	1 to 3 1/2 inches (31.8 to 88.9 mm)
Design Thickness	0.0188 to 0.1242 inches (0.478 to 3.155 mm)

*Channel, furring, and other shapes and flat strap for bracing is not limited in dimension.

2.9 MANUFACTURING

The cold-formed steel framing products included in this study are manufactured by eleven companies in their respective facilities throughout North America from hot dip galvanized steel. In general, galvanized steel coil is unloaded onto an uncoiler, slit, fed into a rollformer in which an oil-based lubricant may be applied. In the rollformer the studs, track and other framing products are formed.

2.10 PACKAGING

The products are packaged using wood or plastic banding, plastic sheeting, and wood and lumber products.

2.11 FURTHER INFORMATION

Further information on the product can be found on SFIA's website: www.cfsteel.org

3. LCA: Calculation Rules

3.1 DECLARED UNIT

The declared unit used in the study is defined as one (1) metric ton of industry-averaged cold-formed steel framing products, in accordance with PCR requirements.

Table 3. *The modules and unit processes included in the scope for the steel framing products.*

Module	Module Description	Unit Processes Included in Scope
A1	Extraction and processing of raw materials; any reuse of products or materials from previous product systems; processing of secondary materials; generation of electricity from primary energy resources; energy, or other, recovery processes from secondary fuels	Raw material extraction and processing, including all activities necessary for the reprocessing steel scrap, including but not limited to the recovery or extraction and processing of feedstock materials. This stage includes BOF and EAF Steelmaking, and the hot dip galvanization process.
A2	Transport (to the manufacturer)	Transportation from primary production to steel product forming facilities
A3	Manufacturing, including ancillary material production	Manufacture of cold-formed steel framing products and packaging materials.
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

3.4 UNITS

All data and results are presented using SI units.

3.5 ESTIMATES AND ASSUMPTIONS

- Data for steelmaking is taken from the Sphera report on Steelmaking in North America (Sphera, 2020)[8] produced for the American Iron and Steel Institute (AISI). Resource use (e.g., electricity, natural gas, water), waste/co-products, and emissions released, are allocated on a mass-basis to steel and co-products (EAF dust, slag, baghouse dust and millscale).
- Representative inventory data were used to reflect the energy mix for electricity use. Supply mixes were modeled based on U.S. EPA eGRID subregions in which each manufacturing facility is located (CAMX, NWPP, ERCT, RMPA, SRSO, SRVC, FRCC, RFCM and RFCW). One manufacturing facility was located in Mexico, for which the nationally-specific ecoinvent dataset was used.
- Where necessary, representative inventory data for raw materials and ancillary materials were modeled with unit process data taken from Ecoinvent 3.7.1 (ecoinvent 2020)[9]. The datasets utilized for steel framing product manufacture are provided in Section 4.4.
- Electricity and resource use at the manufacturing facilities is allocated to the steel framing products based on product mass.
- Disposal of manufacturing waste is modeled based on statistics for solid and hazardous waste generation and disposal in the United States, as specified in the PCR. Specifically, 80% of non-hazardous wastes are disposed in landfill and 20% incinerated. Transportation for end-of-life scenarios for manufacturing wastes was modeled using the EPA WARM model assumption of 20 miles (~32 km) (US EPA, 2004)[10], from the manufacturer 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.

The PCR requires the results for several inventory flows related to construction products to be reported including energy and resource use as well as waste and outflows. These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted considering this limitation.

3.6 CUT-OFF RULES

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD.

3.7 DATA SOURCES

Primary data were provided directly by the manufacturers for one of their manufacturing facilities. Representative manufacturing site locations were selected to include locations from diverse geographies across the U.S. and Mexico. Data for the upstream hot dip galvanized steel production (steelmaking, rolling, pickling, cold rolling, and hot dip galvanization) LCI and impact data were taken from the Sphera report. Where the necessary data was not available in the Sphera report, Ecoinvent datasets for BOF and EAF steelmaking were used. The sources of secondary LCI data are the Ecoinvent database.

Table 4. *Data sources for the industry-average LCA of the cold-formed steel framing products.*

Flow	Dataset	Data Source	Publication Date
Raw Materials			
Water	market for tap water | tap water | Cutoff, U - RoW	Ecoinventv3.7.1	2020
Solvent	market for solvent, organic | solvent, organic | Cutoff, U - GLO	Ecoinventv3.7.1	2020
Argon gas	market for argon, liquid | argon, liquid | Cutoff, U - RoW	Ecoinventv3.7.1	2020
Lubricating oil	market for lubricating oil | lubricating oil | Cutoff, U - RoW	Ecoinventv3.7.1	2020
Packaging			
Corrugated box board	corrugated board box production | corrugated board box | Cutoff, U - RoW	Ecoinventv3.7.1	2020
Wood pallets	EUR-flat pallet production | EUR-flat pallet | Cutoff, U - RoW	Ecoinventv3.7.1	2020
Metal banding	metal working, average for steel product manufacturing | metal working, average for steel product manufacturing | Cutoff, U – RoW market for steel, low-alloyed | steel, low-alloyed | Cutoff, U - GLO	Ecoinventv3.7.1	2020
Plastic/ polypropylene banding	textile production, non woven polypropylene, spun bond | textile, non-woven polypropylene | Cutoff, U - RoW	Ecoinventv3.7.1	2020
Electricity/Heat			
Electricity	electricity, medium voltage, modifieid for egrid Subregions electricity voltage transformation from high to medium voltage | electricity, medium voltage | Cutoff, U - MX	Ecoinventv3.7.1 egrid 2018v2	2020, 2018
Propane	market for propane | propane | Cutoff, U	Ecoinventv3.7.1	2020
Heavy fuel oil	market for heavy fuel oil | heavy fuel oil | Cutoff, U - RoW	Ecoinventv3.7.1	2020
Natural gas	market for heat, district or industrial, natural gas | heat, district or industrial, natural gas | Cutoff, U - RoW	Ecoinventv3.7.1	2020
Transportation			
Rail	market for transport, freight train | transport, freight train | Cutoff, U - US	Ecoinventv3.7.1	2020
Road	transport, freight, lorry 7.5-16 metric ton, EURO4 | transport, freight, lorry 7.5-16 metric ton, EURO4 | Cutoff, U - RoW	Ecoinventv3.7.1	2020
Ship	transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, U - GLO	Ecoinventv3.7.1	2020

3.8 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 for the cold-formed steel framing products.*

Data Quality Parameter/ Description	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 (typically 2018 or more recent). All of the data used represented an average of at least one year's worth of data collection. Manufacturer-supplied data (primary data) are based on annual production for 2019.
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 product disposal 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 cold formed steel framing products. 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.
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 for modules A2 and A3. Data sources of similar quality and age are used with a bias towards Ecoinvent v3.7.1 data where available. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the wastes produced is based on assumptions of current average practices in the United States. Consistency of the A1 module is limited by the background report on HDG production.
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	Primary data representing materials use, energy use, emissions and waste generation 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. Secondary data for HDG steel production in North America was obtained from the Sphera LCA report produced for AISI.
Uncertainty of the Information Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the steel products is low. Actual supplier data for upstream operations was not available for suppliers and the study relied upon the use of the life cycle inventory developed by Sphera. This inventory and other datasets used 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.

3.9 PERIOD UNDER REVIEW

The period of review is January 01, 2019 through December 31, 2019 for most of the manufacturers. Two manufacturing facilities provided data for a full year beginning in 2019 and ending in 2020.

3.10 ALLOCATION

With respect to the steel scrap, the 100-0 recycled content approach is used in which the recycled material bears only the burden of any processing from waste material.

Mass allocation was deemed the most accurate and reproducible way of calculating the energy and material requirements for the manufacture of steel and co-products. The results from the Sphera report on North American steelmaking use physical allocation for the production of hot dip galvanized steel and co-products. Some background datasets used within the Sphera report are taken from GaBi and may use system expansion.

Primary data for resource use at each facility (e.g., electricity, natural gas, water), waste/co-products, and emissions released for steel framing products manufacture, are allocated on a mass-basis as a fraction of total annual production.

The transportation from primary producer of hot dip galvanized steel is based on primary data provided by the product manufacturers, including modes, distances, and amount of steel transported from each supplier. Transportation was allocated on the basis of the mass and distance the material was transported.

3.11 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.

4. LCA: Scenarios and Additional Technical Information

Manufacturing

The HDG steel is produced in steelmaking facilities using both basic oxygen furnace (BOF) and electric arc furnace (EAF) steelmaking across North America. The LCI and LCIA results for HDG steel reflect the representative percent of EAF and BOF steel produced in North America.

The cold-formed steel framing products included in this study are manufactured by eleven companies in their respective facilities throughout North America from hot dip galvanized steel. Galvanized steel coil is unloaded onto an uncoiler, slit, fed into a rollformer in which an oil-based lubricant may be applied. In the rollformer the studs, track and other accessories are formed.

Transportation of waste materials at manufacturing assumes a 20 mile (~32 km) average distance to disposal, consistent with assumptions used in the US EPA WARM model. Assumed disposal rates for nonhazardous wastes are based on US EPA SMM rates of 20% incineration and 80% landfilled. Hazardous wastes are disposed by incineration.

5. 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 (US EPA, 2012)[11].

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 Potential **(FFD)**	MJ Surplus, LHV

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. *Life Cycle Impact Assessment (LCIA) results for one (1) metric ton of industry-average CFS framing products. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Impact Category	Life cycle stage			
	A1	A2	A3	Total (A1-A3)
TRACI 2.1				
GWP (kg CO_2 eq)	2220	84.4	135	2440
	91.0%	3.46%	5.55%	100%
AP (kg SO_2 eq)	4.45	0.500	0.628	5.58
	79.8%	8.96%	11.3%	100%
EP (kg N eq)	0.270	0.107	0.433	0.81
	33.4%	13.3%	53.4%	100%
SFP (kg O_3 eq)	77.1	13.3	10.6	101
	76.3%	13.2%	10.5%	100%
ODP (kg CFC-11 eq)	6.02×10^{-7}	1.88×10^{-5}	1.43×10^{-5}	3.37×10^{-5}
	1.79%	55.8%	42.5%	100%
FFD (MJ eq)	26,300	171	292	26,800
	98.3%	0.638%	1.09%	100%

Table 7. *Life Cycle Impact Assessment (LCIA) results for one (1) metric ton of CFS framing products across manufacturers. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.*

Impact Category	Average	Median	Minimum	Maximum
TRACI 2.1				
GWP (kg CO_2 eq)	2,380	2,380	2,250	2,610
AP (kg SO_2 eq)	5.21	5.07	4.55	6.39
EP (kg N eq)	0.621	0.538	0.369	1.43
SFP (kg O_3 eq)	93.5	89.4	78.4	112.5
ODP (kg CFC-11 eq)	2.88×10^{-5}	2.71×10^{-5}	5.80×10^{-6}	6.01×10^{-5}
FFD (MJ eq)	26,600	26,600	26,400	27,100

Table 8. *Resource use and waste flows for one (1) metric ton of steel framing product across manufacturers, and 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	Total	A1	A2	A3
Resources				
RPRE (MJ)	5,260	1,450	11.5	3,800
	100%	27.5%	0.218%	72.2%
RPRM (MJ)	1,270	0.00	0.00	1,273
	100%	0.0%	0.0%	100%
NRPRE (MJ)	28,700	26,400	632	1,700
NRPRM (MJ)	626	0.0	0.0	626
SM (MT)	361	361	0	0
	100%	100%	0%	0%
RSF/NRSF (MJ)	0.00	0.00	0.00	0.00
RE (MJ)	0.00	0.00	0.00	0.00
FW (m3)	3.57×10^{4}	3.57×10^{4}	0.332	24.0
	100%	99.9%	0.000931%	0.0672%
Wastes				
HWD (kg)*	0.238	0.230	1.77×10^{-3}	2.40×10^{-3}
	100%	98.2%	0.757%	1.02%
NHWD (kg)*	736	685	21.7	29.0
	100%	93.1%	2.96%	3.95%
HLRW (kg)*	6.24×10^{-3}	5.72×10^{-3}	5.24×10^{-5}	4.64×10^{-4}
	100%	91.7%	0.841%	7.44%
ILLRW (kg)*	4.31×10^{-2}	3.38×10^{-2}	4.29×10^{-3}	5.06×10^{-3}
	100%	78.3%	9.96%	11.7%
CRU (kg)	0.00	0.00	0.00	0.00
MR (kg)	186	134	0.00	51.7
	100%	72.2%	0.0%	27.8%
MER (kg)	0.00	0.00	0.00	0.00
EE (MJ)	Neg.	Neg.	Neg.	Neg.

Neg. = Negligible
*Calculated using secondary data for A1 through hot rolling. Pickling, cold rolling and hot dip galvanization modeled using Sphera report.

Additionally, the PCR requires the calculation of carbon emissions and removals. The biogenic carbon included in the product system are attributed to the wood and cardboard packaging.

Table 9. *Biogenic carbon removal and emission for one (1) metric ton of industry-average steel framing product and packaging. All values are rounded to three significant digits.*

Biogenic carbon removal from product	-0.0559	kg
Biogenic carbon emission from product	0.0	kg
Biogenic carbon removal from packaging	157	kg
Biogenic carbon emission from packaging	0.0	kg

6. LCA: Interpretation

The contributions to total impact indicator results are dominated by the raw material extraction and production stage, primarily from HDG steel production (A1), followed by the product manufacture stage (A3) for some indicators. The exception to this is ozone depletion, for which the upstream transportation stage is dominant (A2).

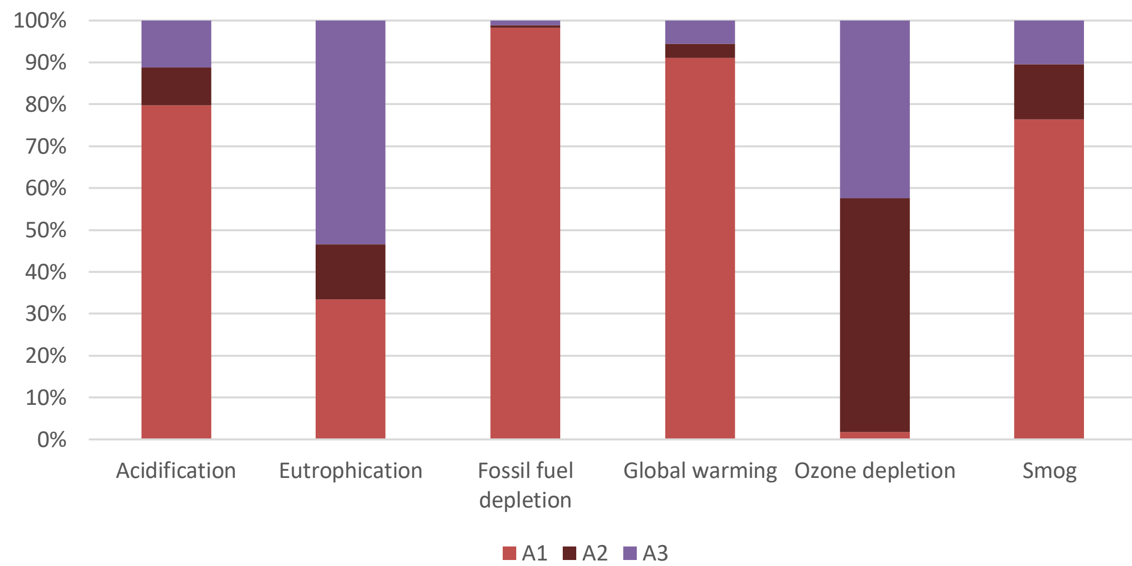


Figure 2. *Contribution analysis for the industry-average steel framing product.*

Limitations

- Primary data for A1 were taken from a life cycle inventory of HDG steel produced in the US, developed by Sphera under contract with AISI. The background datasets used in the Sphera report are taken from the GaBi database, and some datasets may use system expansion. Without access to the raw data, it would be impossible to remodel the A1 data without system expansion.
- 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.
- For some of these parameters, i.e., NWHD, HWD, HLRW, and ILRW, insufficient information was provided in the Sphera report for steelmaking using BOF and EAF production routes. For these parameters only, secondary datasets from ecoinvent for BOF and EAF steelmaking were used, and HDG steel production from steel slab was modeled using the Sphera LCI for HDG steel production
- 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.
- Comparison of the environmental performance of steel 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.
- 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.

7. References

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