Expanding Your Solutions

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner

CEMCO, LLC
13191 Crossroads Pkwy.
North Ste. 325 City of Industry, CA 91746
Phone: (800) 775-2362
Email: info@cemcosteel.com
www.cemcosteel.com

Product:

Cold formed steel framing and accessory products

Declared Unit

The declared unit is one metric ton of steel framing product.

EPD Number and Period of Validity

SCS-EPD-08938
EPD Valid May 3, 2023 through May 2, 2028

Product Category Rule

PCR Guidance for Version 3.2. UL Environment. Sept. 2018

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

Program Operator

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

SCSglobal SERVICES

Declaration owner:	CEMCO, LLC.
Address:	13191 Crossroads Pkwy. North Ste. 325 City of Industry, CA 91746
Declaration Number:	SCS-EPD-08938
Declaration Validity Period:	EPD Valid May 3, 2023 through May 2, 2028
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 1.11 software and the Ecoinvent v3.8 database
Product's Intended Application:	Steel framing products used in various construction applications
Product RSL:	n/a
Markets of Applicability:	Global
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Gate
LCIA Method and Version:	CML-IA 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 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. CEMCO, LLC.

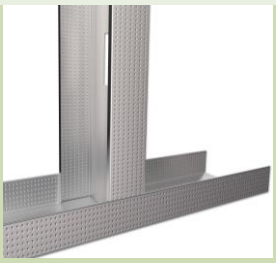
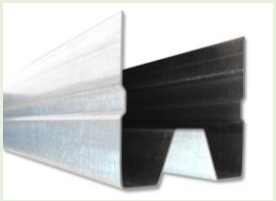
Since 1974, CEMCO® has taken a leadership role to provide you the most advanced products and systems for steel framing and metal lath construction. Delivering the safest products we can produce, such as the new Safety Edged® steel framing products, gives you safer handling of framing products on your trucks, in your yards, and on your jobsites. CEMCO® also manufactures slotted track for your fire-rated head-of-wall applications. Other innovations such as Sure-Board® for shear-walls, Sure-Span® steel floor joists and the ProX Header® and ProX Rough-Opening framing systems are also available to help complete your environmentally responsible project. CEMCO's four state-of-the-art manufacturing facilities are located in City of Industry, CA (Metropolitan Los Angeles); Denver, CO; Ft. Worth, TX; and Pittsburg, CA (Oakland/San Francisco Bay Area).

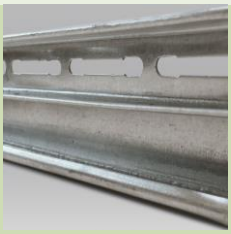
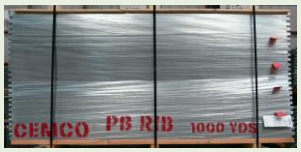
2. Products

2.1 PRODUCT DESCRIPTION

The steel framing products in this study are used primarily for structural or non-structural framing in construction products. Descriptions, specifications, and pictures of each product can be found in Table 1. The products conform generally to the UNSPSC product code 30103600 for structural products.

Table 1. *Product names, descriptions, intended application, and picture for each of the framing products contained in this study*

Product Name	Product Description and Specifications	Product Image
ViperStud® Interior Framing	ViperStud® non-load bearing framing system is a proprietary interior framing system using high-strength steel roll-formed into c-shaped studs and tracks in thicknesses ranging from 15 mil to 33 mil and manufactured in accordance with ICC-ES ESR#2620. **Product Specifications:** ASTM C645	
Viper-X® Interior Framing	Viper-X® non-load bearing framing system is a proprietary interior framing system using high-strength steel roll-formed into c-shaped studs and tracks in thicknesses ranging from 18 mil to 22 mil and manufactured in accordance with IAPMO UER #0524. **Product Specifications:** ASTM C645	
ProX Header®	ProX Header® is a proprietry header and rough-opening framing system designed to use less material and increase safety during the installation process. ProX Header components are manufactured in thicknesses ranging from 33 mil to 68 mil. ProX Header products are manufactured in accordance with IAPMO UER#0286. **Product Specifications:** ASTM C955	
CST Brand Slotted Tracks	CEMCO's CST slotted track products are head-of-wall tracks designed for seismic movement in buildings. These products are manufactured in c-shapes ranging in thicknesses from 30 mil to 68 mil. CST products are manufactured in accordance with ICC-ES ESR#2012. **Product Specifications:** ASTM C645	

Product Name	Product Description and Specifications	Product Image
Sure-Board for Shear®	Sure-Board for Shear® panels are a composite product manufactured using hot-dipped galvanized steel with a gypsum-based sheathing for wall, roof, and floor applications. All Sure-Board products are produced in accordance with IAPMO UER#0126. **Product Specifications:** ASTM C645	
Sure-Span® Floor Joists	Sure-Span® steel floor joists and rim tracks are manufactured from hot-dipped galvanized steel into c-shaped joists with large-openings and pre-spaced/indexed rim-tracks in thicknesses ranging from 43 mil to 97 mil. **Product Specifications:** ASTM C955	
CEMCO CT Brand CT Studs	CEMCO's CT shaft wall studs are manufactured from hot-dipped galvanized steel into CT-shaped studs for fire-rated shaft walls and stairwells in 33 mil and 43 mil thicknesses. All CT products are manufactured in accordance with ICC-ES ESR# 4934. **Product Specifications:** ASTM C645	
CH Brand Shaft Studs	CEMCO manufacturers USG SHEETROCK Brand CH shaft wall studs and J-Runners for shaft wall and stairwell applications as well as H-studs and C-runners for area separation walls. These products are manufactured from hot-dipped galvanized steel in accordance with AER #09038. **Product Specifications:** ASTM C645	
Metal Lath and Plastering Accessories	CEMCO's metal lath and plastering accessories are manufactured from hot-dipped galvanized steel in several configurations in accordance with ICC-ES ESR 1623. **Product Specifications** Metal Lath: ASTM C847 Plastering Accessories: ASTM C1047	 

CEMCO manufacturers steel framing products with an average density of 7,850 kg/m^3.

The products come in various sizes and thicknesses, from 1.75 mm to 118 mm.

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.

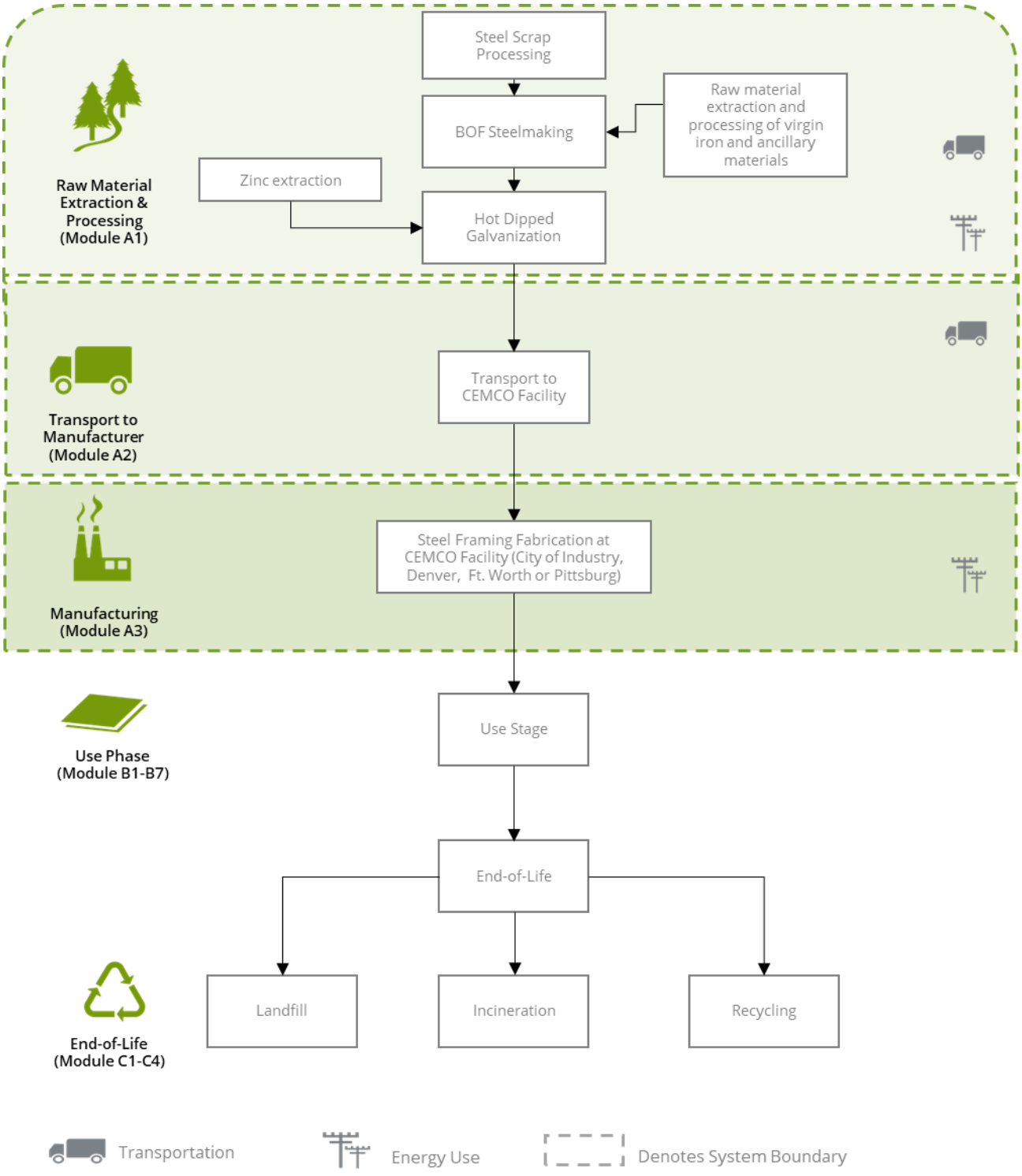


Figure 1. *Flow diagram representing the major processes in the production of the steel framing products and accessories.*

2.3 DECLARATION OF METHODOLOGICAL FRAMEWORK

The scope of the EPD is cradle-to-gate, the extraction of raw materials and processing, including all activities and transport necessary for the production of steel framing product at the steel mill. The life cycle phases included in the product system boundary are shown below.

Table 2. *Life cycle phases included in the CEMCO framing 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

All products conform to the material specifications under ASTM A653/A1003 and coating specifications under ASTM A653/A924 for Sure-Board® or A653/A924/A1003 for all other types.

2.5 INTENDED APPLICATION

The steel framing products serve the primary function of providing structural or nonstructural framing in construction applications

2.6 MATERIAL COMPOSITION

The steel framing products modeled in this study are manufactured from 100% hot dipped galvanized (HDG) steel from various suppliers, as described in section 2.5. All products conform to the material specifications under ASTM A653/A1003 and coating specifications under ASTM A653/A924 for Sure-Board® or A653/A924/A1003 for all other types.

Steel products under normal conditions do not present inhalation, ingestion, or contact health hazards. These products are used inside the building envelope, or other structures, and do not include materials or substances which have potential route of exposure to humans or flora/fauna in the environment.

2.7 PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The products come in various sizes and thicknesses, as described in Table 3.

Table 3. *Product sizes and thicknesses, as delivered*

Product	Sizes	Thicknesses (mils)
ViperStud® Interior Framing	1-5/8" – 6" Stud & Track	15, 18, 30, 33
Viper-X® Interior Framing	1-5/8" – 6" Stud & Track	18, 22
ProX Header®	3-5/8" – 8" Headers & Inserts	33, 43, 54, 68
Sure-Board ® for Shear	48" x 96", 108", 120", or 144"	27, 33, 43, 54, 68
Sure-Span ® Floor Joists	7-1/4" – 14" Joists and Rim-Track	43, 54, 68, 97
CST Brand Slotted Tracks	2-1/2" – 8" Slotted Tracks	30, 33, 43, 54, 68
CH Brand Shaft Studs	2-1/2" – 6" CH & H-Studs, J-Runner & C-Runner	33, 34
CT Brand CT Studs and J-Runner	2-1/2"-6"	33, 34, 43
Expanded Metal Lath	27-1/2" x 48" or 96"	16, 23
Plastering Accessories	Various	18 through 33

2.8 MANUFACTURING

The final products are manufactured at four CEMCO facilities in City of Industry, CA; Denver, CO; Ft Worth, TX; and Pittsburg, CA. The manufacture of framing products includes bending, cutting, and manufacture of framing product shapes. The HDG steel received at each CEMCO facility for fabrication is sourced from mills in the US, including California Steel Industries in Fontana, CA, US Steel UPI in Pittsburg, CA and Cleveland Cliffs in East Chicago, Illinois.

2.9 PACKAGING

Packaging for the steel framing product includes lumber, plastic banding and metal banding.

2.10 FURTHER INFORMATION

Further information on the product can be found on the manufacturers' website at www.cemcosteel.com

3. LCA: Calculation Rules

3.1 DECLARED UNIT

The declared unit used in the study is defined as one (1) metric ton of cold formed steel framing and accessories, consistent with the PCR.

Table 4. *The modules and unit processes included in the scope for the CEMCO steel framing and accessories.*

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 but not limited to the recovery or extraction and processing of feedstock materials and including all activities necessary for the reprocessing steel scrap; Steelmaking and rolling of framing product
A2	Transport (to the manufacturer)	Transportation from primary production to the CEMCO facilities
A3	Manufacturing, including ancillary material production	Fabrication of the final framing product products
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

3.2 UNITS

All data and results are presented using SI units.

3.3 ESTIMATES AND ASSUMPTIONS

- Where necessary, the production of steel and steel scrap were modeled with unit process data taken from Ecoinvent. The datasets utilized for steel production are provided in Section 3.3. Impact results for the California Steel Industries HDG were taken from the 2021 LCA report, obtained with permission from CSI. The Cleveland Cliffs and USS UPI steel were modeled by building the Life cycle inventory of HDG using the AISI report, "Life Cycle Inventories of North American Steel Products," from November 2020.

- Representative inventory data for raw materials and ancillary materials were modeled with unit process data taken from Ecoinvent. Representative inventory data were used to reflect the energy mix for electricity use at each of the fabrication facilities, CAMX for City of Industry and Pittsburg, RMPA for Denver, and ERCT for Ft. Worth.

- Disposal of manufacturing waste is modeled based for solid and hazardous waste generation and disposal in the United States, as specified in the PCR. Specifically, where the disposal was done by a third party, 80% of non-hazardous wastes are disposed in landfill and 20% incinerated. Transportation for end-of-life scenarios was 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.

3.4 CUT-OFF RULES

The cut-off criteria for including or excluding materials, energy, and emissions data from the study are in accordance with the PCR and are listed below.

- All inputs and outputs to a unit process are included in the LCA calculation for which data are available. Any data gaps are filled with representative data. Assumptions used for filling data gaps are documented in the LCA report.

- Where there is a data gap or insufficient data, criteria for exclusion of inputs and outputs is 1% of primary energy usage (renewable and non-renewable energy) and 1% on a mass basis for the specific unit process. The maximum criteria for exclusion of inputs and outputs is 5% of primary energy usage and mass across all modules included in the LCA.

- If a flow meets the above criteria for exclusion but is considered to have a significant potential environmental impact, it is included.

3.5 DATA SOURCES

Unit processes were developed within openLCA v1.11 software. For fabrication, confidential primary data were provided by CEMCO. For upstream steelmaking and HDG production, impact results were taken from an LCA report from CSI and modeled in ecoinvent using the AISI report for other suppliers. The principal source of secondary LCI data is Ecoinvent v3.8 database. Detailed descriptions of unit processes can be found in the accompanying documentation. The LCI datasets used in the LCA model to represent unit processes in the cradle-to-gate LCA are provided in Table 5 below.

Table 5. *Data sources for the CEMCO steel framing products.*

Flow	Dataset	Data Source	Publication Date
Hot Dipped Galvanized Steel modeled using AISI report LCI			
Electricity	market group for electricity, medium voltage | electricity, medium voltage | Cutoff, U – US	Ecoinvent 3.8	2021
Natural gas	market for heat, district or industrial, natural gas | heat, district or industrial, natural gas | Cutoff, U - RoW	Ecoinvent 3.8	2021
Nitrogen	market for nitrogen, liquid | nitrogen, liquid | Cutoff, U - RoW	Ecoinvent 3.8	2021
Steam	steam production, in chemical industry | steam, in chemical industry | Cutoff, U - RoW	Ecoinvent 3.8	2021
Zinc	market for zinc | zinc | Cutoff, U - GLO	Ecoinvent 3.8	2021
HCl	market for hydrochloric acid, without water, in 30% solution state | hydrochloric acid, without water, in 30% solution state | Cutoff, U - RoW	Ecoinvent 3.8	2021
Steel	steel production, converter, low-alloyed | steel, low-alloyed | Cutoff, U - RoW	Ecoinvent 3.8	2021
Packaging			
Lumber	market for sawnwood, board, softwood, dried (u=10%), planed | sawnwood, board, softwood, dried (u=10%), planed | Cutoff, U - Europe without Switzerland	Ecoinvent 3.8	2021
Plastic banding	market for polyethylene, high density, granulate | polyethylene, high density, granulate | Cutoff, U - GLO	Ecoinvent 3.8	2021
Metal banding	market for steel, low-alloyed | steel, low-alloyed | Cutoff, U - GLO sheet rolling, steel | sheet rolling, steel | Cutoff, U - RoW	Ecoinvent 3.8	2021
Electricity Use			
Electricity	electricity voltage transformation from high to medium voltage | electricity, medium voltage | Cutoff, U - US-WECC * modified for CAMX and RMPA electricity voltage transformation from high to medium voltage | electricity, medium voltage | Cutoff, U - US-TRE *modified for ERCT	Ecoinvent 3.8 Egrid2020	2021 2022
Propane	market for propane | propane | Cutoff, U - GLO	Ecoinvent 3.8	2021
Transportation			
Rail	transport, freight train, diesel | transport, freight train | Cutoff, U - US	Ecoinvent 3.8	2021
Road	transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RoW	Ecoinvent 3.8	2021

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 6. *Data quality assessment for the CEMCO steel framing product system.*

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 (typically 2017 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 2021 at each of the four CEMCO, LLC facilities.
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	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 framing product. 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	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 moderate to high. Data sources of similar quality and age are used with a bias towards Ecoinvent v3.8 data. However, the CSI LCA results were modeled using Ecoinvent v3.7.1 data and based on two years of production. 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. 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 CEMCO manufacturing facility 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. Steel supplier data was accounted for using supplier, mill-specific EPDs for fabricated or unfabricated framing product.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the steel framing product 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 period of review for the steel framing produced at each of the four CEMCO fabrication facilities is from January 1, 2021 through December 31, 2021.

3.8 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 steel framing product and its useful byproducts. 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 CEMCO facilities are based on primary data provided by CEMCO, including modes, distances, and amount of steel transported. Transportation was allocated based on the mass and distance the material was transported.

3.9 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 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.

4. LCA: Scenarios and Additional Technical Information

Manufacturing

The HDG steel received at each CEMCO facility for fabrication is sourced from mills in the US, including California Steel Industries in Fontana, CA, US Steel UPI in Pittsburg, CA and Cleveland Cliffs in East Chicago, Illinois. Upstream steel production for US Steel and Cleveland Cliffs was modeled using the ecoinvent data source for blast oxygen furnace (BOF) manufacturing and modifying for the US eGRID subregion grid mix in which the BOF is located. Hot dip galvanization requires several steel processing steps including rolling, pickling, cold rolling and adding a layer of zinc coating during hot dip galvanization, modeled with representative data for North America.

The fabrication of framing products includes bending, cutting, and manufacture of framing product shapes. Primary data for calendar year 2021 were collected from CEMCO for each of its four fabrication facilities. Electricity and resource use at each facility are allocated to the steel framing products based on product mass. Electricity was modeled using the ecoinvent datasets for the eGRID region and modified for the US EPA eGRID subregions in which each facility is located.

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 and CML-IA.

CMLI-A Impact Category	Unit	TRACI 2.1 Impact Category	Unit
Global Warming Potential **(GWP)**	kg CO_2 eq	Global Warming Potential **(GWP)**	kg CO_2 eq
Depletion potential of the stratospheric ozone layer **(ODP)**	kg CFC 11 eq	Ozone Depletion Potential **(ODP)**	kg CFC 11 eq
Acidification Potential of soil and water **(AP)**	kg SO_2 eq	Acidification Potential **(AP)**	kg SO_2 eq
Eutrophication Potential **(EP)**	kg PO_4^{3-} eq	Eutrophication Potential **(EP)**	kg N eq
Photochemical Oxidant Creation Potential **(POCP)**	kg C_2H_4 eq	Smog Formation Potential **(SFP)**	kg O_3 eq
Abiotic depletion potential **(ADP-elements)** for non-fossil resources	kg Sb eq	Fossil Fuel Depletion Potential **(FFD)**	MJ Surplus, LHV
Abiotic depletion potential **(ADP-fossil fuels)** for fossil resources	MJ, 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 7. *LCIA results for the declared unit of steel framing products produced at the City of Industry facility. All values are rounded to three significant digits. Values below indicator results show the percent contribution of each life cycle module to the result for each impact category.*

Impact Category (Units)	A1 Upstream Material (HDG) Production	A2 Transport to Manufacturer	A3 Framing Products Manufacture	Total (A1-A3)
TRACI				
Global Warming Potential ($kg\ CO_2$ eq)	2,620	18.6	19.5	2,660
	99%	1%	1%	100%
Acidification Potential ($kg\ SO_2$ eq)	11.6	0.0838	0.0934	11.8
	99%	1%	1%	100%
Eutrophication Potential (kg N eq)	10.6	0.0203	0.0736	10.7
	99%	0%	1%	100%
Smog Formation Potential ($kg\ O_3$ eq)	186	2.03	2.12	191
	98%	1%	1%	100%
Ozone Depletion Potential (kg CFC-11 eq)	$1.86x10^{-4}$	$4.31x10^{-6}$	$2.16x10^{-6}$	$1.93x10^{-4}$
	97%	2%	1%	100%
Fossil Fuel Depletion (MJ eq)	2,120	39.3	35.5	2,190
	97%	2%	2%	101%
CML-IA				
GWP ($kg\ CO_2$ eq)	2,660	18.6	19.6	2,690
	99%	1%	1%	100%
AP ($kg\ SO_2$ eq)	11.0	0.0714	0.0801	11.2
	99%	1%	1%	100%
EP ($kg\ (PO_4)^{3-}$ eq)	5.25	0.0167	0.0413	5.31
	99%	0%	1%	100%
POCP ($kg\ C_2H_4$ eq)	1.12	0.00243	0.0114	1.14
	99%	0%	1%	100%
ODP (kg CFC-11 eq)	$1.52x10^{-4}$	$3.23x10^{-6}$	$1.67x10^{-6}$	$1.57x10^{-4}$
	97%	2%	1%	100%
ADPE (kg Sb eq)	$7.57x10^{-3}$	$6.45x10^{-5}$	$1.30x10^{-4}$	$7.76x10^{-3}$
	97%	1%	2%	100%
ADPF (MJ)	27,800	275	299	28,300
	98%	1%	1%	100%

Table 8. *LCIA results for the declared unit of steel framing products produced at the Denver facility. All values are rounded to three significant digits. Values below indicator results show the percent contribution of each life cycle module to the result for each impact category.*

Impact Category (Units)	A1 Upstream Material (HDG) Production	A2 Transport to Manufacturer	A3 Framing Products Manufacture	Total (A1-A3)
TRACI				
Global Warming Potential (kg CO_2 eq)	2,550	83.5	34.2	2,670
	96%	3%	1%	1.00
Acidification Potential (kg SO_2 eq)	10.3	0.814	0.102	11.3
	92%	7%	1%	1.00
Eutrophication Potential (kg N eq)	10.1	0.145	0.109	10.3
	98%	1%	1%	100%
Smog Formation Potential (kg O_3 eq)	158	24.1	2.25	184
	86%	13%	1%	100%
Ozone Depletion Potential (kg CFC-11 eq)	$1.60x10^{-4}$	$1.59x10^{-5}$	$2.33x10^{-6}$	$1.78x10^{-4}$
	90%	9%	1%	100%
Fossil Fuel Depletion (MJ eq)	1,670	143	38.3	1,850
	90%	8%	2%	100%
CML-IA				
GWP (kg CO_2 eq)	2,580	83.7	34.3	2,700
	96%	3%	1%	100%
AP (kg SO_2 eq)	9.87	0.640	0.0883	10.6
	93%	6%	1%	100%
EP (kg $(PO_4)^{3-}$ eq)	4.92	0.166	0.0571	5.14
	96%	3%	1%	100%
POCP (kg C_2H_4 eq)	1.15	0.0186	0.0118	1.18
	97%	2%	1%	100%
ODP (kg CFC-11 eq)	$1.32x10^{-4}$	$1.20x10^{-5}$	$1.79x10^{-6}$	$1.46x10^{-4}$
	91%	8%	1%	100%
ADPE (kg Sb eq)	0.0439	$3.23x10^{-4}$	$1.32x10^{-4}$	0.0444
	99%	1%	0%	100%
ADPF (MJ)	26,000	1,070	341	27,400
	95%	4%	1%	100%

Table 9. *LCIA results for the declared unit of steel framing product produced at the Ft. Worth facility. All values are rounded to three significant digits. Values below indicator results show the percent contribution of each life cycle module to the result for each impact category.*

Impact Category (Units)	A1 Upstream Material (HDG) Production	A2 Transport to Manufacturer	A3 Framing Products Manufacture	Total (A1-A3)
TRACI				
Global Warming Potential (kg CO_2 eq)	2,550	95.0	42.9	2,690
	96%	4%	2%	101%
Acidification Potential (kg SO_2 eq)	10.4	0.926	0.143	11.4
	0.92	0.08	0.01	101%
Eutrophication Potential (kg N eq)	10.1	0.165	0.255	10.5
	98%	2%	2%	102%
Smog Formation Potential (kg O_3 eq)	158	27.5	2.52	188
	86%	15%	1%	102%
Ozone Depletion Potential (kg CFC-11 eq)	$1.59x10^{-4}$	$1.81x10^{-5}$	$3.95x10^{-6}$	$1.82x10^{-4}$
	0.90	0.10	0.02	102%
Fossil Fuel Depletion (MJ eq)	1,660	163	67.1	1,890
	90%	9%	4%	102%
CML-IA				
GWP (kg CO_2 eq)	2,580	95.2	43.2	2,720
	95%	4%	2%	100%
AP (kg SO_2 eq)	9.88	0.728	0.133	10.7
	92%	7%	1%	100%
EP (kg $(PO_4)^{3-}$ eq)	4.92	0.189	0.119	5.23
	94%	4%	2%	100%
POCP (kg C_2H_4 eq)	1.15	0.0211	0.0148	1.18
	97%	2%	1%	100%
ODP (kg CFC-11 eq)	$1.32x10^{-4}$	$1.36x10^{-5}$	$3.06x10^{-6}$	$1.49x10^{-4}$
	89%	9%	2%	100%
ADPE (kg Sb eq)	0.0432	$3.68x10^{-4}$	$1.46x10^{-4}$	0.0437
	99%	1%	0%	100%
ADPF (MJ)	25,900	1,220	576	27,700
	94%	4%	2%	100%

Table 10. *LCIA results for the declared unit of steel framing product produced at the Pittsburg facility. All values are rounded to three significant digits. Values below indicator results show the percent contribution of each life cycle module to the result for each impact category.*

Impact Category (Units)	A1 Upstream Material (HDG) Production	A2 Transport to Manufacturer	A3 Framing Products Manufacture	Total (A1-A3)
TRACI				
Global Warming Potential (kg CO_2 eq)	2,520	27.3	20.6	2,570
	98%	1%	1%	100%
Acidification Potential (kg SO_2 eq)	9.96	0.123	0.0935	10.2
	98%	1%	1%	100%
Eutrophication Potential (kg N eq)	10.1	0.0298	0.0736	10.2
	99%	0%	1%	100%
Smog Formation Potential (kg O_3 eq)	152	2.98	2.12	157
	97%	2%	1%	100%
Ozone Depletion Potential (kg CFC-11 eq)	$1.53x10^{-4}$	$6.33x10^{-6}$	$2.17x10^{-6}$	$1.61x10^{-4}$
	95%	4%	1%	100%
Fossil Fuel Depletion (MJ eq)	1,550	57.8	35.6	1,650
	94%	4%	2%	100%
CML-IA				
GWP (kg CO_2 eq)	2,550	27.3	20.7	2,590
	98%	1%	1%	100%
AP (kg SO_2 eq)	9.51	0.105	0.0801	9.69
	98%	1%	1%	100%
EP (kg $(PO_4)^{3-}$ eq)	4.90	0.0246	0.0414	4.97
	99%	0%	1%	100%
POCP (kg C_2H_4 eq)	1.15	0.00358	0.0114	1.16
	99%	0%	1%	100%
ODP (kg CFC-11 eq)	$1.27x10^{-4}$	$4.75x10^{-6}$	$1.67x10^{-6}$	$1.33x10^{-4}$
	95%	4%	1%	100%
ADPE (kg Sb eq)	0.0516	$9.49x10^{-5}$	$1.30x10^{-4}$	0.0518
	100%	0%	0%	100%
ADPF (MJ)	25,400	405	299	26,100
	97%	2%	1%	100%

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

Table 11. *Resource use and waste flows per metric ton of steel framing product manufactured by CEMCO LLC in City of Industry, 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	A1	A2	A3	Total
Resources				
RPRE (MJ)	2,680	3.15	2,160	4,840
	55%	0%	45%	100%
RPRM (MJ)	0.00	0.00	250	250
	0%	0%	100%	100%
NRPRE (MJ)	23,500	261	293	24,100
NRPRM (MJ)	0.203	0.0	180	180
SM (kg)	188	0.00	0.00	188
	100%	0%	0%	100%
RSF/NRSF (MJ)	neg.	neg.	neg.	neg.
RE (MJ)	neg.	neg.	neg.	neg.
FW (m^3)	32.7	0.116	0.890	33.7
	97%	0%	3%	100%
Wastes				
HWD (kg)	0.412	$7.37x10^{-4}$	$8.30x10^{-4}$	0.414
	100%	0%	0%	100%
NHWD (kg)	1,080	14.2	7.63	1,110
	96%	1%	1%	98%
HLRW (kg)	$7.89x10^{-3}$	$1.41x10^{-5}$	$1.47x10^{-4}$	$8.05x10^{-3}$
	98%	0%	2%	100%
ILLRW (kg)	$5.38x10^{-2}$	$1.81x10^{-3}$	$1.24x10^{-3}$	$5.68x10^{-2}$
	95%	3%	2%	100%
CRU (kg)	0.0	0.0	0.0	0.0
MR (kg)	$2.53x10^{-2}$	0.00	$6.07x10^{-3}$	$3.14x10^{-2}$
	81%	0%	19%	100%
MER (kg)	0.0	0.0	0.0	0.0
EE (MJ)	0.0	0.0	0.0	0.0

Table 12. *Resource use and waste flows per metric ton of steel framing product manufactured by CEMCO LLC in Denver, 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	A1	A2	A3	Total
Resources				
RPRE (MJ)	2,530	28.7	2,170	4,730
	54%	1%	46%	100%
RPRM (MJ)	0.00	0.00	250	250
	0%	0%	100%	100%
NRPRE (MJ)	23,400	1,020	325	24,800
NRPRM (MJ)	0.203	0.0	180	180
SM (kg)	209	0.00	0.00	209
	100%	0%	0%	100%
RSF/NRSF (MJ)	neg.	neg.	neg.	neg.
RE (MJ)	neg.	neg.	neg.	neg.
FW (m^3)	37.5	0.904	1.06	39.5
	95%	2%	3%	100%
Wastes				0
HWD (kg)	0.388	$3.02x10^{-3}$	$8.37x10^{-4}$	0.392
	99%	1%	0%	100%
NHWD (kg)	1,110	13.4	7.83	1,130
	98%	1%	1%	100%
HLRW (kg)	$7.66x10^{-3}$	$1.16x10^{-4}$	$1.48x10^{-4}$	$7.92x10^{-3}$
	97%	1%	2%	100%
ILLRW (kg)	$4.95x10^{-2}$	$6.57x10^{-3}$	$1.25x10^{-3}$	$5.73x10^{-2}$
	86%	11%	2%	100%
CRU (kg)	0.0	0.0	0.0	0.0
MR (kg)	0.162	0.00	$6.07x10^{-3}$	0.168
	96%	0%	4%	100%
MER (kg)	0.0	0.0	0.0	0.0
EE (MJ)	0.0	0.0	0.0	0.0

Table 13. *Resource use and waste flows per metric ton of steel framing product manufactured by CEMCO LLC in Ft. Worth, 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	A1	A2	A3	Total
Resources				
RPRE (MJ)	2,530	32.6	2,200	4,760
	53%	1%	46%	100%
RPRM (MJ)	0.00	0.00	250	250
	0%	0%	100%	100%
NRPRE (MJ)	23,400	1,160	503	25,100
NRPRM (MJ)	0.203	0.0	180	180
SM (kg)	208	0.00	0.00	208
	100%	0%	0%	100%
RSF/NRSF (MJ)	neg.	neg.	neg.	neg.
RE (MJ)	neg.	neg.	neg.	neg.
FW (m^3)	37.4	1.03	2.54	41.0
	91%	3%	6%	100%
Wastes				0
HWD (kg)	0.388	$3.43x10^{-3}$	$8.70x10^{-4}$	0.392
	99%	1%	0%	100%
NHWD (kg)	1,110	15.2	8.40	1,130
	98%	1%	1%	100%
HLRW (kg)	$7.66x10^{-3}$	$1.32x10^{-4}$	$3.50x10^{-4}$	$8.14x10^{-3}$
	94%	2%	4%	100%
ILLRW (kg)	$4.95x10^{-2}$	$7.47x10^{-3}$	$2.10x10^{-3}$	$5.91x10^{-2}$
	84%	13%	4%	100%
CRU (kg)	0	0	0	0
MR (kg)	0.160	0.00	$6.03x10^{-3}$	0.166
	96%	0%	4%	100%
MER (kg)	0.0	0.0	0.0	0.0
EE (MJ)	0.0	0.0	0.0	0.0

Table 14. *Resource use and waste flows per metric ton of steel framing product manufactured by CEMCO LLC in Pittsburg, 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	A1	A2	A3	Total
Resources				
RPRE (MJ)	2,650	4.63	2,160	4,810
	55%	0%	45%	100%
RPRM (MJ)	0.00	0.00	250	250
	0%	0%	100%	100%
NRPRE (MJ)	22,900	384	293	23,600
NRPRM (MJ)	0.203	0.0	180	180
SM (kg)	213	0.00	0.00	213
	100%	0%	0%	100%
RSF/NRSF (MJ)	neg.	neg.	neg.	neg.
RE (MJ)	neg.	neg.	neg.	neg.
FW (m^3)	36.7	0.171	0.890	37.7
	97%	0%	2%	100%
Wastes				0
HWD (kg)	0.382	$1.08x10^{-3}$	$8.30x10^{-4}$	0.384
	100%	0%	0%	100%
NHWD (kg)	1,110	20.8	7.65	1,140
	98%	2%	1%	100%
HLRW (kg)	$6.64x10^{-3}$	$2.08x10^{-5}$	$1.47x10^{-4}$	$6.81x10^{-3}$
	98%	0%	2%	100%
ILLRW (kg)	$4.44x10^{-2}$	$2.66x10^{-3}$	$1.24x10^{-3}$	$4.83x10^{-2}$
	92%	6%	3%	100%
CRU (kg)	0.0	0.0	0.0	0.0
MR (kg)	0.191	0.00	$6.07x10^{-3}$	0.197
	97%	0%	3%	100%
MER (kg)	0	0	0	0
EE (MJ)	0	0	0	0

The PCR requires the calculation of carbon emissions and removals. Biogenic carbon is not included in the product but is included in the wood-based packaging materials. Biogenic carbon emissions are not included in the A1-A3 modules as packaging disposal occurs during installation and is outside the scope.

- Biogenic carbon emissions and removals in product: 0.
- Biogenic carbon removal in packaging materials: 12.5 kg per functional unit (metric ton of framing or steel product) for each facility.

6. LCA: Interpretation

Life cycle modeling of the CEMCO, LLC steel framing product was divided into distinct life cycle phases, including raw material extraction and processing, product manufacturing, delivery and installation, product use and maintenance, and disposal. A detailed examination of the potential environmental impacts provides some insight into the relative contributions from each of the product's life cycle phases.

The following life cycle phases were included in the contribution analysis:

- Raw Materials and Processing (Sourcing/Extraction) stage (A1) – This stage includes extraction of virgin materials and reclamation of non-virgin feedstock. This includes the extraction of all raw materials, including the transport to the manufacturing site. Resource use and emissions associated with both extraction of the raw materials product component manufacturing are included.
- Transport stage (A2) –The impacts associated with the transport of the processed raw materials to the CEMCO facilities in City of Industry, Denver, Ft. Worth and Pittsburg are included in this stage.
- Manufacturing stage (A3) – This stage includes all the relevant manufacturing processes and flows, including the impacts from energy use and emissions at the CEMCO facilities in City of Industry, Denver, Ft. Worth and Pittsburg. Production of capital goods, infrastructure, manufacturing equipment, and personnel-related activities are not included. This stage also includes the transport between the steel mill and rolling mill. Additionally, this stage includes packaging.

The main contributions to indicator results for the steel framing product are the Raw Material Extraction and Processing (A1) stage, contributing 85-99% of the impact in most cases.

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 or data taken from supplier LCAs.

Comparison of the environmental performance of construction products should be based on the product's use in a building, considering the complete life cycle. Results that do not consider the complete building context are inappropriate for comparing construction products. As the scope of this LCA is the production of steel construction products, and does not include impacts on the building, indicator results presented in this LCA cannot be compared directly to another material type, unless these products have equivalent use phase impacts and identical effects on the whole building.

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.

Limitations in Life Cycle Impact Assessment Phase

There are several important limitations in the LCIA methodologies used, which are based upon the requirements of the PCR. These limitations are described below.

There may be additional impacts relevant to the production of Steel Framing products at the manufacturing facilities. Some of these omitted impact categories are listed in Table 15. This list is not exhaustive; there may be other impact categories which are not included.

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.

7. References

- Life Cycle Assessment of Steel Framing and Accessories manufactured by for CEMCO, LLC. SCS Global Services Report. Prepared for CEMCO, LLC. February 2023.
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
- ISO 14040: 2006 Environmental Management – Life cycle assessment – Principles and Framework
- ISO 14044: 2006/Amd 1:2017/ Amd 2:2020 Environmental Management – Life cycle assessment – Requirements and Guidelines.
- 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
- PCR Guidance for Building-Related Products and Services Part B: Designated Steel Construction Product EPD Requirements. Version 2. UL Environment. August 2020.
- SCS Type III Environmental Declaration Program: Program Operator Manual. V11.0 November 2021. SCS Global Services.
- Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI). Dr. Bare, J., https://www.epa.gov/chemical-research/tool-reduction-and-assessment-chemicals-and-other-environmental-impacts-traci
- CML-IA Characterization Factors. Leiden University, Institute of Environmental Sciences. April 2013. http://cml.leiden.edu/software/data-cmlia.html
- Ecoinvent Centre (2021) ecoinvent data from v3.8. Swiss Center for Life Cycle Inventories, Dübendorf, 2021, http://www.ecoinvent.org
- European Joint Research Commission. International Reference Life Cycle Data System handbook. *General guide for Life Cycle Assessment – Detailed Guidance.* © European Union, 2010.
- "WARM Model Transportation Research – Draft." Memorandum from ICF Consulting to United States Environmental Protection Agency. September 7, 2004. http://epa.gov/epawaste/conserve/tools/warm/SWMGHGreport.html#background.

For more information, contact:

CEMCO, LLC.

13191 Crossroads Pkwy.

North Ste. 325 City of Industry, CA 91746

Phone: (800) 775-2362

Email: info@cemcosteel.com

www.cemcosteel.com

SCS Global Services

2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA

Main +1.510.452.8000 | fax +1.510.452.8001