MRI STEEL FRAMING LLC

BUILDSMART.

VERIFIED by SCS Global Services ENVIRONMENTAL PRODUCT DECLARATION BASED ON LCA

Declaration Owner

MRI Steel Framing, LLC
15 Salt Creek Lane, Suite 412,
Hinsdale, IL 60521
Phone: (630) 616-1850
Email: info@mristeelframing.com
www.mristeelframing.com

Product:

Cold-formed steel framing products

Declared Unit

The declared unit is one metric ton of steel framing products

EPD Number and Period of Validity

SCS-EPD-08959
EPD Valid May 9, 2023 through May 8, 2028
Version: May 10, 2023

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:	MRI Steel Framing, LLC
Address:	15 Salt Creek Lane, Suite 412, Hinsdale, IL 60521
Declaration Number:	SCS-EPD-08959
Declaration Validity Period:	EPD Valid May 9, 2023 through May 8, 2028
Version:	May 10, 2023
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 v3.7.1 database
Product's Intended Application:	Cold-formed steel framing 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. MRI Steel Framing, LLC

MRI Steel Framing is a leading manufacturer of heavy duty, traditional and equivalent flat-steel framing components.

2. Products

2.1 PRODUCT DESCRIPTION

The cold-formed steel framing products in this EPD are used primarily for structural or non-structural framing of interior and exterior walls, roof, floors and ceilings. MRI Steel Framing manufactures steel framing products with an average density of 7,850 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.

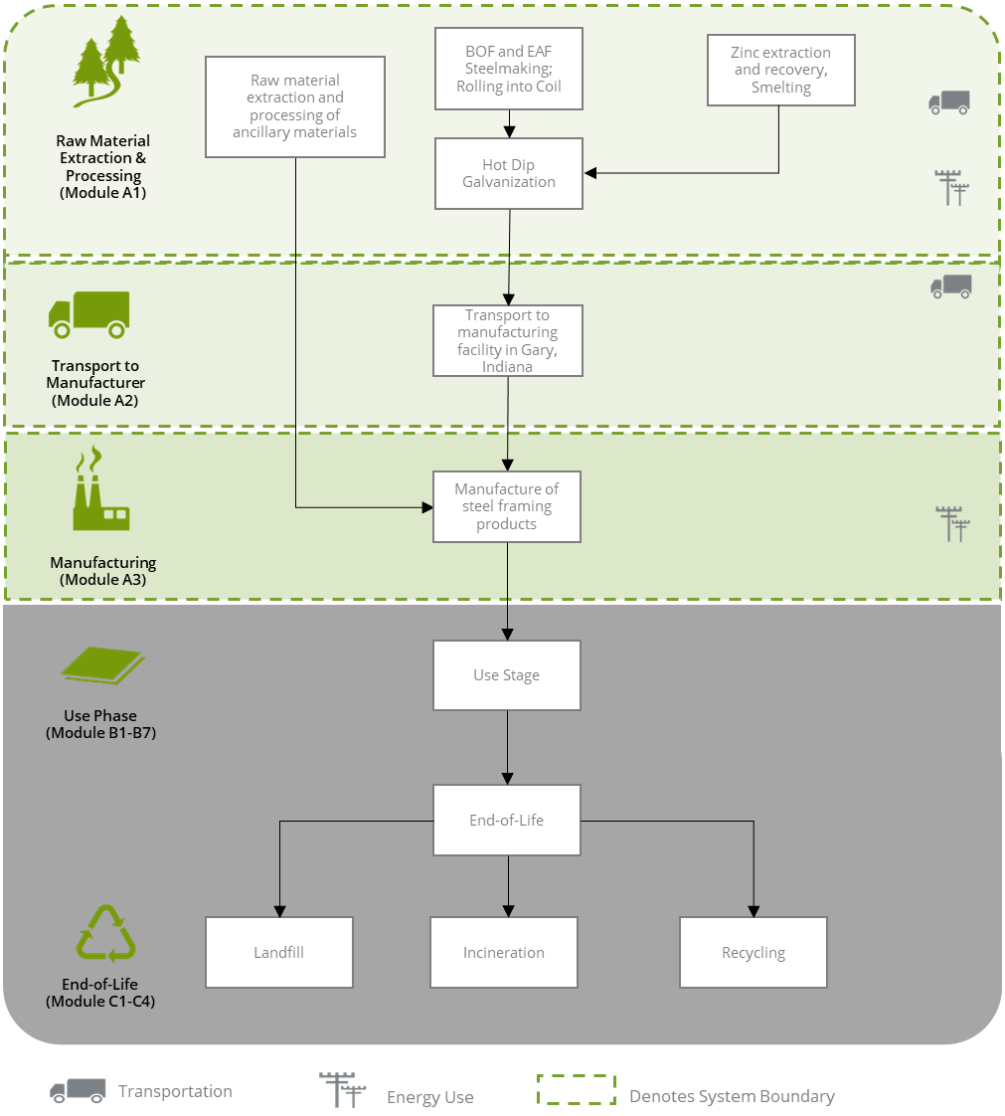

Figure 1. *Flow diagram representing the major processes in the manufacture of cold-formed steel framing products.*

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 and manufacture of steel framing products. The life cycle phases included in the product system boundary are shown below.

Table 1. *Life cycle phases included in the MRI Steel Framing steel framing products system boundary.*

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

X = Module Included | MND = Module Not Declared

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

2.4 TECHNICAL DATA

The Gary, Indiana facility produces cold-formed steel framing products conformant with AISI Standards S220 and S240 and ICC-ES AC86-2019. The products fall under the UNSPSC classifications: 05 40 00 Cold-formed Metal Framing and 09 22 16 Nonstructural Metal Framing.

2.5 INTENDED APPLICATION

The cold-formed steel framing products can be used in a variety of applications for interior wall, exterior wall, roof and floor framing.

2.6 MATERIAL COMPOSITION

The cold-formed steel framing products modeled in this study are manufactured from hot dipped galvanized (HDG) steel coil from various steel distribution centers, as described in section 4. Based on the composition from the report used to model representative North American HDG steel coil, the coil contains less than 1% of zinc and over 99% steel.

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 are available in various sizes and thicknesses, as described in Table 2.

Table 2. *Product sizes and thicknesses, as delivered.*

Product	Sizes
MRISmart 27mil EQ Stud	Web Size Range: 1-5/8", 2½", 3½", 3-5/8", 4", 5½", 6" Flange: 1¼" Return/Lip: 3/16"
MRISmart 27 mil EQ Track	Web Size Range: 1-5/8", 2½", 3½", 3-5/8", 4", 5½", 6" Leg Range: 1¼", 1½", 2", 2½", 3"
MRIPrimeWall® Prime Wall EQ Stud 19/21mil EQ Stud	Web Size Range: 1-5/8", 2½", 3-5/8", 4", 6" Flange: 1-11/32" Return/Lip: ¼" (on 1-5/8" stud), 13/32" Design Thickness: 0.020" (2-½", 3-5/8", 4" studs) and 0.0221" (6", 1-5/8" studs)
MRIPrimeWall® Prime Wall EQ Track 19/21mil EQ Track	Web Size Range: 1-5/8", 2½", 3-5/8", 4", 6" Leg Range: 1¼", 1½", 2", 3" Design Thickness: .020"
MRI Traditional Structural Stud and Track	Gauge: 33, 43, 54, 68, 97, 118 mil (20-10 ga) Flange: 1-3/8", 1-5/8", 2", 2½", 3", 3½", 4" Web Size Range: 2½" - 16" Leg Range: 1¼", 1½", 2", 2½", 3", 3½", 4"
MRI Traditional Non-Structural Stud and Track	Gauge: 18, 27, 30 and 33 mil (25 -20 ga.) Flange: 1¼" Leg Range: 1½", 2", 2½", 3" Web Size Range: 1-5/8", 2½", 3½", 3-5/8", 4", 5½" and 6"
MRI Slotted Track	Gauge: 18, 30, 33, 43, 54, and 68 mil (25-14 ga) Web Size Range: 2½" - 16" Flange and Slot Size: 2½" w/ 1½" slot 3" w/ 2" slot 3½" w/ 2½" slot

2.8 MANUFACTURING

The cold-formed steel framing products included in this EPD are manufactured by MRI Steel Framing in its Gary, Indiana facility from hot dipped galvanized (HDG) steel coil. The HDG steel coil is produced in steelmaking facilities using both basic oxygen furnace (BOF) and electric arc furnace (EAF) steelmaking across North America.

The final products are manufactured at the MRI Steel Framing facility in Gary, Indiana. The manufacture of framing products includes bending, cutting, and manufacture of framing product shapes.

2.9 PACKAGING

Packaging for the steel framing products 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.mristeelframing.com

3. LCA: Calculation Rules

3.1 DECLARED UNIT

The declared unit used in this study is one metric ton of steel products, consistent with the PCR.

Table 3. *The modules and unit processes included in the scope for MRI Steel Framing cold-formed 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	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 and product component manufacturing are included.
A2	Transport (to the manufacturer)	The impacts associated with the transport of the raw materials, including HDG and ancillary materials, to the MRI Steel Framing facility in Gary, Indiana are included in this stage.
A3	Manufacturing, including ancillary material production	This stage includes all the relevant manufacturing processes and flows, including the impacts from energy use and emissions at the MRI Steel Framing facility in Gary, Indiana. Production of capital goods, infrastructure, manufacturing equipment, and personnel-related activities are not included. Additionally, this stage includes packaging and manufacturing waste disposal.
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

The assessment relied on several assumptions, described below.

- For upstream hot dipped galvanized steel production, impact results were taken from an AISI report on North American steel products produced by Sphera (2).
- Representative inventory data were used to reflect the energy mix for electricity use. Supply mixes were modeled based on the U.S. EPA eGRID subregion RFCW, in which the manufacturing facility is located.
- Representative inventory data for raw materials and ancillary materials were modeled with unit process data taken from Ecoinvent. The datasets utilized for the steel framing products manufacture are provided in Section 4.4

- 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, 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 v1.10 software. For product manufacture, confidential primary data were provided by MRI Steel Framing. For upstream steelmaking and HDG production, impact results were modeled in ecoinvent using the AISI report for HDG. The principal source of secondary LCI data is Ecoinvent v3.7.1 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 4 below.

Table 4. *LCI datasets and associated databases used to model the product systems for MRI Steel Framing, LLC.*

Flow	Dataset	Data Source	Publication Date
Raw Materials			
HDG	HDG Steel coil impacts, using mass-based allocation	"Life Cycle Inventories of North American Steel Products." by Sphera for AISI	2020
Lubricating oil	market for lubricating oil | lubricating oil | Cutoff, U - RoW	Ecoinventv3.7.1	2020
Packaging			
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 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, for RFC modified for egrid Subregion RFCW	Ecoinventv3.7.1 egrid 2021	2020, 2023
Propane	market for propane | propane | Cutoff, U	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			
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

3.6 DATA QUALITY

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

Table 5. *Data quality assessment for the MRI 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 2019 at the MRI Steel Framing facility.
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 cold-formed 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 but could be improved with primary data from suppliers.
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 v3.7.1 data. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current average practices in Europe and North America.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. 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 MRI Steel Framing 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. 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 cold-formed steel framing products is moderate to 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

Primary data for calendar year 2019 were collected from MRI Steel Framing for its Gary, Indiana facility.

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 cold-formed steel framing products. Primary data for resource use (e.g., electricity, natural gas, water), wastes, and emissions released, are allocated on a mass-basis as a fraction of total annual production. The data taken from the Sphera report are all those which use physical (mass-based) allocation of the co-products.

The transportation from primary producer of material components to the MRI Steel Framing facility are based on primary data provided by MRI Steel Framing, including modes, distances, and amount of steel transported. Transportation was allocated on the basis of 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 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 steel framing products included in this study are manufactured by MRI Steel Framing in its Gary, Indiana facility from hot dipped galvanized (HDG) steel coil The HDG is purchased from distribution centers located across North America. The HDG steel coil is produced in steelmaking facilities using both basic oxygen furnace (BOF) and electric arc furnace (EAF) steelmaking. The transport of materials to the manufacturing facilities is based on primary data on the transport distance and mode of transport for steel transported to the manufacturing facilities.

Data for HDG steelmaking is taken from the Sphera report on Steelmaking in North America, produced for AISI.

The final products are manufactured at the MRI Steel Framing facility in Gary, Indiana. The manufacture of framing products includes bending, cutting, and manufacture of framing product shapes. Primary data for calendar year 2019 were collected from MRI Steel Framing for its Gary, Indiana facility. The facility is located in the RFCW eGRID subregion. The electricity supply mix for the manufacturing facility was modeled using ecoinvent electricity grid and modified for the eGRID subregion. Electricity and resource use at the facility are allocated to the cold-formed steel framing products based on product mass.

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

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 6. *LCIA results for the declared unit of steel framing products produced at the MRI Steel Framing 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 Materials Production	A2 Transport to Manufacturer	A3 Framing Products Manufacture	Total (A1-A3)
TRACI				
Global Warming Potential (kg CO_2 eq)	2,210	90.2	69.2	2,370
	93.3%	3.81%	2.92%	100%
Acidification Potential (kg SO_2 eq)	4.40	0.409	0.189	5.00
	88.03%	8.18%	3.78%	100%
Eutrophication Potential (kg N eq)	0.224	0.100	0.129	0.453
	49.4%	22.1%	28.4%	100%
Smog Formation Potential (kg O_3 eq)	76.4	9.90	2.75	89.0
	85.8%	11.1%	3.09%	100%
Ozone Depletion Potential (kg CFC-11 eq)	$5.42x10^{-11}$	$2.10x10^{-5}$	$7.39x10^{-6}$	$2.84x10^{-5}$
	0.00%	74.0%	26.02%	100%
Fossil Fuel Depletion (MJ eq)	26,300	191	137	26,600
	98.8%	0.72%	0.52%	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 7. *Resource use and waste flows per metric ton of steel framing product manufactured by MRI Steel Framing LLC in Gary, Indiana, 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 (A1-A3)
Resources				
RPRE (MJ)	1,270	12.1	536	1,820
	70%	1%	29%	100%
RPRM (MJ)	0.0	0.0	194	194
	0.0%	0.0%	100%	100%
NRPRE (MJ)	13,500	1,020	604	15,100
	89%	7%	4%	100%
NRPRM (MJ)	0.0	0.0	5.70	5.70
	0.0%	0.0%	100%	100%
SM (MT)	0.977	0	0	0.977
	100%	0%	0%	100%
RSF/NRSF (MJ)	neg.	neg.	neg.	neg.
RE (MJ)	neg.	neg.	neg.	neg.
FW (m3)	22.9	0.366	1.93	25.1
	91%	1%	8%	100%
Wastes				
HWD (kg)	0.230	0.00284	0.00122	0.234
	98%	1%	1%	100%
NHWD (kg)	684	51.3	5.14	741
	92%	7%	1%	100%
HLRW (kg)	$5.60x10^{-3}$	$5.67x10^{-5}$	$4.40x10^{-4}$	$6.10x10^{-3}$
	92%	1%	7%	100%
ILLRW (kg)	0.0334	$7.07x10^{-3}$	$2.73x10^{-3}$	0.0432
	77%	16%	6%	100%
CRU (kg)	0	0	0	0
MR (kg)	141	0	59.0	200
	70%	0%	30%	100%
MER (kg)	0	0	0	0
EE (MJ)	0	0	0	0

Neg. = Negligible

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: 26.6 kg per functional unit (metric ton of steel framing product).

6. LCA: Interpretation

The main contributions to indicator results for the steel framing product are the Raw Material Extraction and Processing (A1) stage, contributing 46-99% of the impact in most cases, except ozone depletion potential for which the upstream transport (A2) is the most significant module.

Limitations

Limitations in the Study Scope

Primary data on HDG were not obtained by SCS Global Services from suppliers. The results for A1 were taken from a life cycle inventory of HDG produced in the US, developed by Sphera under contract with AISI (2).

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

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.

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 production from steel coil was modeled using the Sphera LCI for HDG production.

7. References

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For more information, contact:

MRI Steel Framing, LLC
15 Salt Creek Lane, Suite 412,
Hinsdale, IL 60521
Phone: (630) 616-1850
Email: info@mristeelframing.com
www.mristeelframing.com

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA
Main +1.510.452.8000 | fax +1.510.452.8001