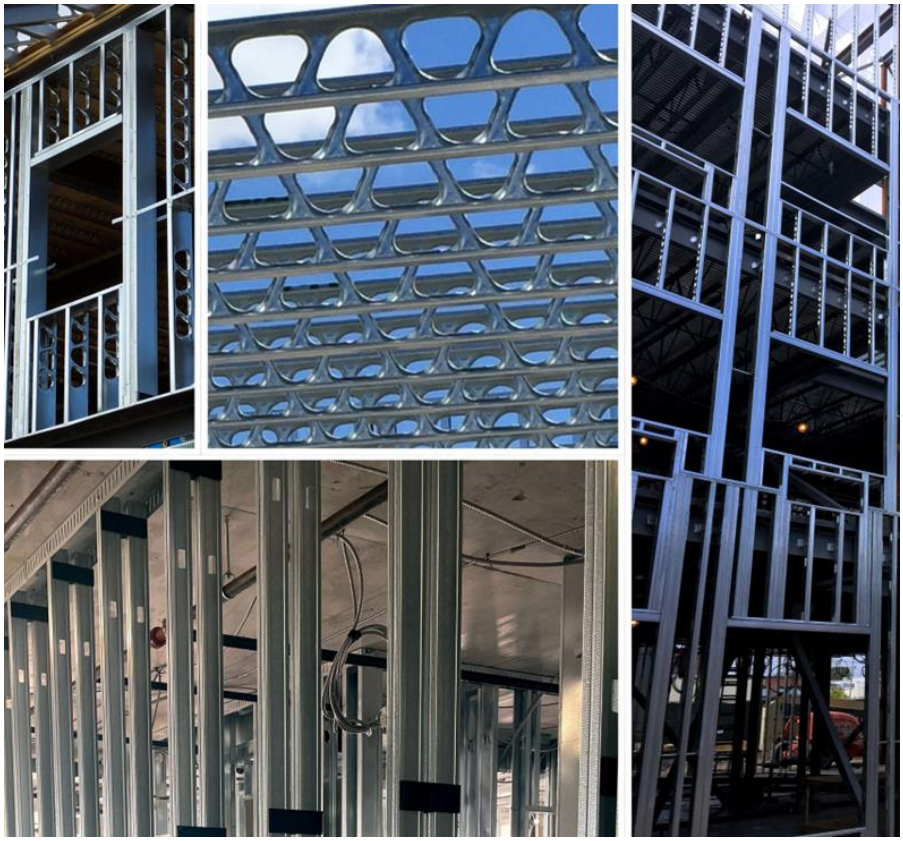
ENVIRONMENTAL PRODUCT DECLARATION

LOW EMBODIED CARBON COLD-FORMED STEEL FRAMING SYSTEMS

STRUCTURAL FRAMING, STRUDRITE®, JOISTRITE®, QUICKFRAME®, VIPERSTUD®, SHAFT WALL, AREA SEPARATION WALL, FAS® TRACK, SLOTTED TRACK, LATH, SOUNDGUARD®, & ACCESSORIES



Marino\WARE manufactures and distributes a wide range of cold-formed steel framing products and accessories. Above are examples of SoundGuard (bottom left), StudRite and QuickFrame (right), StudRite (top left) and our JoistRite system (top middle).

MARINO\WARE®

Sustainability at Marino\WARE®

Marino\WARE believes sustainability and environmental management are not construction industry trends, but corporate responsibilities. Architects, designers, and contractors demand tools and resources to improve the environmental performance of buildings, and Marino\WARE products help them achieve their sustainability objectives.

Steel is inherently a green building product. It can be recycled time and time again. It is our goal to show the construction industry through our company specific Environmental Product Declaration that EAF Low Embodied Carbon Steel (LEC) should be the product of choice for green building professionals.

For additional information, visit www.marinoware.com.

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

MARINO\WARE®

CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION ULCOM/EPD

Marino\WARE®
Low Embodied Carbon (LEC) Cold-Formed Steel Framing Systems

According to ISO 14025, ISO21930:2017 and EN 15804

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions 333 Pfingsten Rd, Northbrook IL, 60062 www.ul.com www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022
MANUFACTURER NAME AND ADDRESS	Marino\WARE | 400 Metuchen Rd. South Plainfield, NJ 07080
DECLARATION NUMBER	4791718437.101.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Cold-Formed Steel Framing products; 1 metric ton
REFERENCE PCR AND VERSION NUMBER	ISO 21930:2017 Part A: Product Category Rules for Building-Related Products and Services, UL 10010, v4.0 Part B: Designated Steel Construction Product EPD Requirements,v2.0
DESCRIPTION OF PRODUCT APPLICATION/USE	Steel Products are used in a wide range of steel framing products and accessories for both commerical and residential construction markets
PRODUCT RSL DESCRIPTION (IF APPL.)	N/A
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	March 27, 2025
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-specific Type III
RANGE OF DATASET VARIABILITY	N/A
EPD SCOPE	Cradle-to-gate
YEAR(S) OF REPORTED PRIMARY DATA	2023
LCA SOFTWARE & VERSION NUMBER	LCA for Experts v10.9.0.31
LCI DATABASE(S) & VERSION NUMBER	Sphera's MLC databases v 2024.1
LCIA METHODOLOGY & VERSION NUMBER	IPCC AR5, TRACI 2.1, CML 2016

The PCR review was conducted by:	UL Solutions PCR Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum, UL Solutions
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sphera
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Marquis Miller, Sustainable Solutions Corporation

ENVIRONMENTAL PRODUCT DECLARATION

Marino\WARE®
Low Embodied Carbon (LEC) Cold-Formed Steel Framing Systems

According to ISO 14025, ISO21930:2017 and EN 15804

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

1. Product Definition and Information

1.1. Description of Company/Organization

Marino\WARE® helps build America. A wholly U.S. owned and operated steel framing manufacturer, Marino\WARE produces a complete line of steel construction products and services used in commercial building across the country.

The company's three large, self-sufficient mega-plants in South Plainfield, NJ, Griffin, GA, and East Chicago, IN sell ViperStud® drywall framing, structural framing, shaftwall, StudRite®, JoistRite®, SoundGuard®, QuickFrame®, ClipSource Connectors, plastering and drywall finishing products- all under one roof.

1.2. Product Description

Product Identification

This Environmental Product Declaration (EPD) covers products manufactured by Marino\WARE using Low Embodied Carbon Steel (LEC), manufactured by various steel mills using the Electric Arc Furnace (EAF) method of steel production. Low Embodied Carbon steel limits are defined by the United States General Services Admistration (GSA) in conjunction with the U.S Environmental Protection Agency's determination of industry average embodied greenhouse gas emissions (12/2022). Products manufactured to meet the requirements of this EPD will be clearly labled as LEC products, and notice to Marino\WARE at the time of order will be required to meet this EPD.

The products covered in the EPD are assumed to be equal on a per mass basis. The Marino\WARE steel framing products covered by this EPD are listed below.

Structural Stud & Track

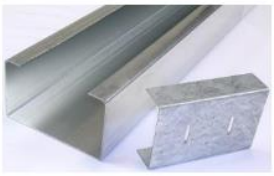
- Used for load-bearing framing, curtain wall, headers, rafters and floor systems
- Conventional C-shape, wide variety of gauges and flange sizes

StudRite®

- Proprietary stud system used for load-bearing framing, rafters, and curtain walls
- Lip reinforced repetitive triangular knockouts
- Lightweight, easy to use, less cutting by trades

JoistRite®

- Used as a floor joist system
- Large lip reinforced repetitive triangular knockouts for easy pass through of trades



QuickFrame®

Rough opening framing system that uses large C-shaped members to replace built up headers and jambs.

ViperStud®

Proprietary drywall framing system that uses thinner high-strength steel to achieve performance equivalent of conventional thickness lower-strength drywall framing members.

Shaftwall

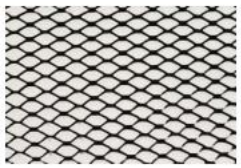
CT stud framing system for non load-bearing framing that allows installation of gypsum wallboard from one side only; easy to use for stairwells and shafts.

Slotted Track and FAS® Track

Fire-rated head-of-wall system that allows for deflection at the ceiling-to-floor intersection while providing a fire-rated joint.

Accessories

Steel framing accessories for interior and exterior framing.



Lath

Expanded metal lath is made by slitting and stretching galvanized steel to create small openings that allow plaster to bond with the lath.

SoundGuard®

Acoustically decoupled stud for interior partitions with high STC ratings.

1.3. Application

Marino\WARE uses electric arc furnace steel to manufacture a wide range of steel framing products and accessories for the commercial and residential construction markets. Common applications include:

- Interior and exterior framing, both for load-bearing and non-load bearing applications

- Interior and exterior finishing
- Floor framing
- Acessories for interior and exterior framing

1.4. Declaration of Methodological Framework

The EPD has been created strictly in accordance with the standards and norms below:

- ISO 14025:2011 Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in building and construction – Environmental declaration of building products, International Organisation for Standardization, Geneva, Switzerland.
- Product Category Rule (PCR) Guidane for building-related products and serices- Part A: Life Cycle Assessment Calculation Rules and Report Requirements v3.2.
- Product Category Rule (PCR) Guidance for building-related products and services- Part B: Designated steel construction product requirements v2.0.

1.5. Technical Requirements

MATERIAL SPECIFICATION (ASTM)

ViperStud® Drywall Nonstructural Framing Members & Accessories A1003/A653
Structural Framing Members & Accessories..... A1003/A653
JoistRite® Framing Members & Accessories A1003/A653
StudRite® Framing Members & Accessories..... A1003/A653
QuickFrame™..... A1003/A653
Shaftwall..... A1003/A653
SoundGuard® A1003/A653

PRODUCT SPECIFICATION

ViperStud® Drywall Nonstructural Framing Members & Accessories ..... AISI S220
Structural Framing Members & Accessories..... AISI S240
JoistRite® Framing Members & Accessories ..... AISI S240
StudRite® Framing Members & Accessories..... AISI S220/S240
QuickFrame™..... AISI S240
Shaftwall..... AISI S220
SoundGuard® ..... AISI S220
Beads & Trims (Metal, Paper, Vinyl) ..... ASTM C1047
Veneer & Plaster Accessories ..... ASTM C841/C1063
Metal Lath..... ASTM C847

COATING SPECIFICATION

	AISI / ASTM
ViperStud® Drywall Nonstructural Framing Members & Accessories	S220/A1003
Structural Framing Members & Accessories	S240/A1003
JoistRite® Framing Members & Accessories	S240/A1003
StudRite® Framing Members & Accessories	S220/S240 & A1003
QuickFrame™	S240/A1003
Shaftwall	S220/A1003
SoundGuard®	S220/A1003
Metal Lath	C847/A1003

CODE EVALUATION REPORTS

ViperStud® Drywall Framing
- Intertek CCRR-0154

CODE COMPLIANCE ETL US Intertek CCRR - 0514

StudRite®
- IAPMO ES ER-781

IAPMO ES ®

Sure-Board®
- IAPMO ES ER-0126
- IAPMO ES ER-0185

JoistRite®
- ICC-ES ESR #1741

ICC ES

ClipSource® Connectors
- ICC-ES ESR #3578

ICC ES

Metal Lath
- ICC-ES ESL #1005

ICC ES LISTED

Structural Stud & Track
- ICC-ES ESR #4062

ICC ES

1.6. Properties of Declared Product as Delivered

PRODUCT	SIZES	THICKNESS (MILS)
STRUCTURAL	1-5/8"-16" Stud & Track	33, 43, 54, 68, 97, 118
STUDRITE	3-5/8", 4", 6", 8"	18, 30, 33, 43, 54, 68, 97
JOISTRITE	8", 9-1/4", 10", 11-1/4", 12", 14", 16"	43, 54, 68, 97
QUIKFRAME	3-5/8", 4", 6", 8"	33, 43, 54, 68, 97, 118
VIPERSTUD	1-5/8"-6"	25eq, 20eq, 30, 33
SHAFTWALL	2-1/2", 4", 6"	18, 30, 33, 43
SLOTTED / FAS TRACK	2-1/2"-10"	18, 30, 33, 43, 54, 68, 97
Accessories	Various	Various
LATH	27"x97"	1.75lb./yd^2, 2.5lb./yd^2, 3.4lb./yd^2
SOUNDGUARD	3-5/8", 4", 6"	18, 30, 33, 43, 54

1.7. Material Composition

Marino\WARE manufactures a variety of steel framing products using electric arc furnace steel. As the forming process solely represents the mechanical shaping of the input material, the product is entirely composed of coated steel. This product does not contain any substances that are classified as hazardous or toxic according to applicable regulations.

MATERIAL	MASS [KG]	MASS %	DQI
Coated Steel	1000	100	Measured

1.8. Manufacturing

The EPD represents Marino\WARE's cold-forming process at three sites using EAF steel, South Plainfield, NJ, Griffin, GA, and East Chicago, IN. The manufacturing operations include the following steps and are summarized in Figure 1.

- Coil slitting
  - Decoiling
  - Slitting
  - Recoiling
- Roll forming
- Packaging
- Loading

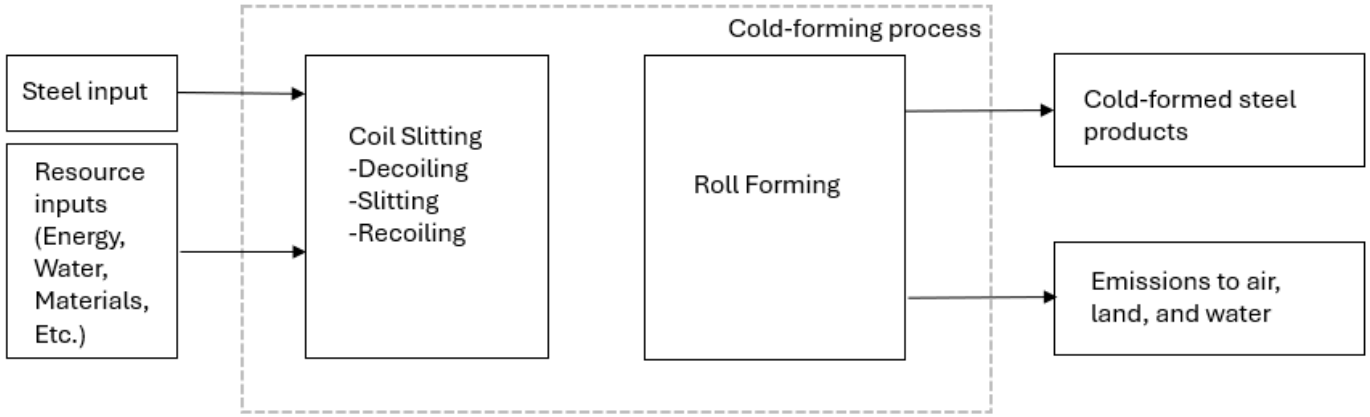


Figure 1: Flow diagram with cold-forming steel manufacturing steps

1.9. Packaging

All of the various steel framed products are packaged and shipped using one of the following materials: steel banding, plastic wrapping, and wooden pallets.

1.10. Transportation

Transportation to customer after prodution is not declared in this EPD.

1.11. Product Installation

Product installation is not declared in this EPD.

1.12. Use

Use of product is not declared in this EPD.

1.13. Reference Service Life and Estimated Building Service Life

As the declared system boundary is A1-A3, a reference service life is not declared.

1.14. Reuse, Recycling, and Energy Recovery

Reuse, Recycling, and Energy Recovery of the product is not declared in this EPD.

1.15. Disposal

Disposal of product is not declared in this EPD.

2. Life Cycle Assessment Background Information

A cradle-to-gate analysis using life cycle assessment (LCA) techniques was conducted for this EPD. The analysis was done according to the product category rule (PCR) for Designated Steel Construction Produts and followed LCA principles, requirements and guidelines laid out in the ISO 14040/14044 standards. As such, EPDs of construction products may not be comparable if they do not comply with the same PCR. While the intent of the PCR is to increase comparability, there may still be differences among EPDs that comply with the same PCR.

2.1. Functional or Declared Unit

The declared unit evaluated for the study is:

1 metric ton of steel-formed product

A declared unit is used in place of a functional unit due to the wide variety of building designs and applications for steel construction products covered by the PCR. Declared units are defined under ISO 21930 and permitted for information modules, for which only a subset of life cycle stages is included in the analysis. The reference flow also considers packaging associated with one metric ton of product. Environmental performance results therefore represent the production average of steel production, normalized to 1 metric ton. The reference service life is not specified. Because the use stage is not included in system scope, no reference service life is necessary for the analysis.

2.2. System Boundary

The declared system boundary is cradle-to-gate. Cradle-to-gate includes the PCR life cycle modules A1, A2, and A3. Capital goods and infrastructure flows are excluded from the product system boundary.The declared system boundaries are shown below:

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X= declared module; MND= module not declared

The system boundary and life cycle stages assessed in this EPD are shown in Figure 2.

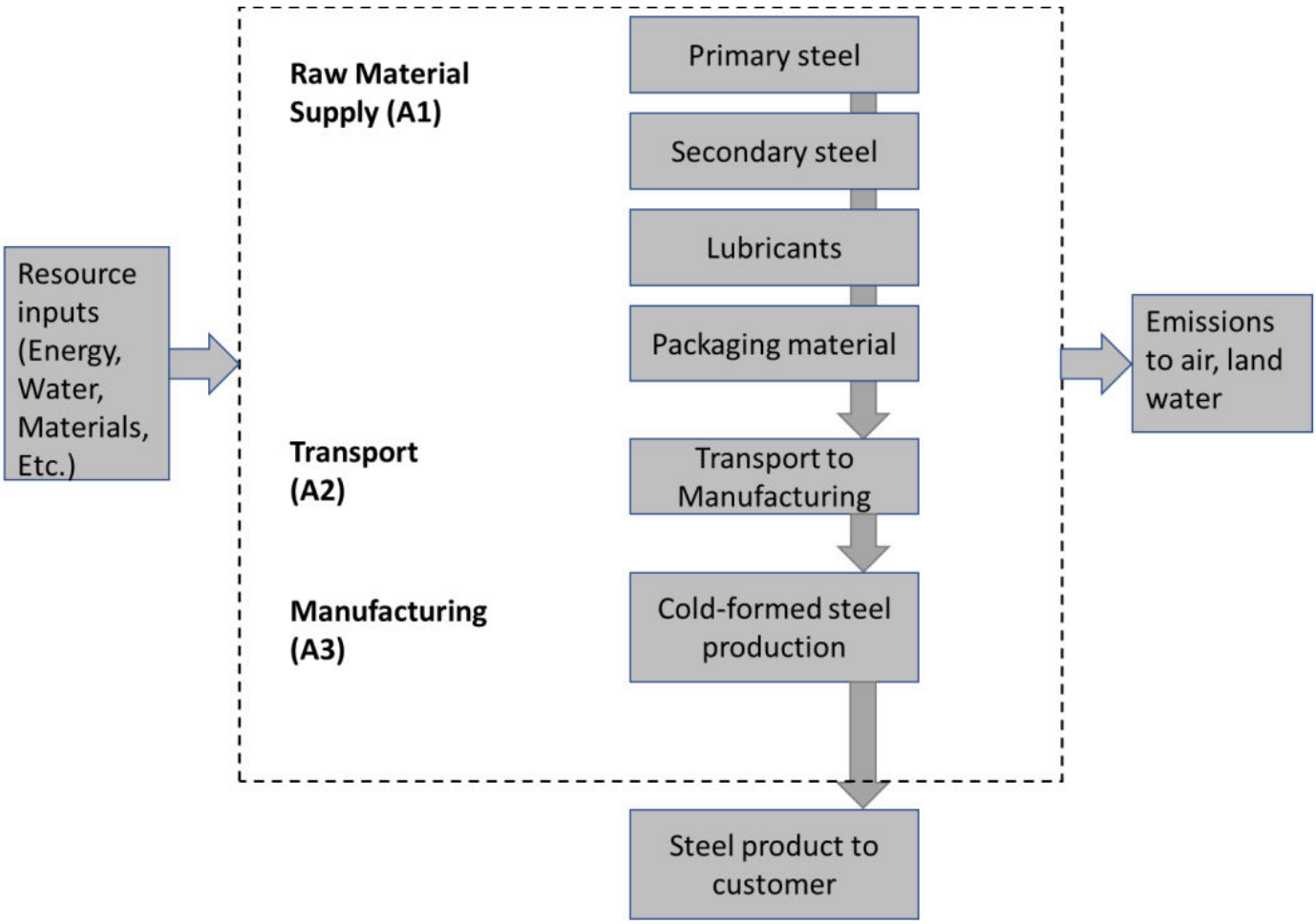


Figure 2: Flow diagram depicting the scope and system boundary.

2.3. Estimates and Assumptions

Product Average

The product specific EPD uses weighted averages based on production output from three production locations. Data from each individual site is reported and a weighted average is used for the total EPD results based on the total production from each facility.

The LCA results were calculated using a weighted average approach based on production volume (mass) to ensure a representative assessment of the three facilities. Each facility's contribution was weighted according to its production share, with the final results derived by multiplying individual site LCA results by their respective production volumes and dividing by the total production. This mass-based allocation method ensures that facilities with higher production volumes have a proportional influence on the overall results, providing a balanced and accurate representation of the environmental impact.

Transport assumptions

The three Marino\WARE plants receive their materials from different sources and distances. For electric arc furnace (EAF) steel inputs, a weighted average mode and distance was applied for the total steel input.

Steel assumptions

As in line with the PCR, all steel manufacturing processes use scrap, regardless of production route. However, input of scrap is considered to enter the system without burden, and reprocessing into valuable secondary steel is assumed to be done outside of the system boundary. This approach is considered to be consistent with a cradle-to-gate analysis, as the load of using scrap as well as the credit of creating scrap at the end-of-life are similarly excluded from the system boundary.

Data approximations

Most of the material inputs declared by Marino\WARE for the production of cold-formed steel products could be matched with corresponding datasets from the MLC 2024.1 database. However, in some few instances a direct match was not possible and proxy data were used instead. It is worth noting that most of these proxies were used for auxiliary and packaging materials that do not significantly contribute to overall mass balances of the unit processes considered in this study.

2.4. Cut-off Criteria

No cut-off criteria are defined for this study. The system boundary was defined based on relevance to the goal of the study. For the processes within the system boundary, all available energy and material flow data have been included in the model. In cases where no matching life cycle inventories are available to represent a flow, proxy data have been applied based on conservative assumptions regarding environmental impacts. The only proxy dataset used was for trains in the transportation section, which is a geographical proxy. No known flows are deliberately excluded from this EPD.

2.5. Data Sources

All upstream background data have been taken from the MLC 2024.1 database, using Sphera's LCAFE software. All manufacturing data were collected from Marino\WARE for the calendar year 2023.

To ensure the highest quality data, primary data were collected by Marino\WARE. Where primary data could not be obtained, background LCI data were sourced from the MLC database, except for steel, for which primary data used in this study are based on suppliers' EPDs. To maintain confidentiality, specific sources are not disclosed in this report but are available upon request.

2.6. Data Quality

Precision and Completeness

Precision: As the majority of the relevant foreground data are measured data or calculated based on primary information sources of the owner of the technology, precision is considered to be high. Seasonal variations were balanced out by using yearly averages. All background data are sourced from MLC databases with documented precision; documentation can be found at https://sphera.com/product-sustainability-gabi-data-search/.

Completeness: Each foreground process was checked for mass balance and completeness of the emission inventory. No data were knowingly omitted. Completeness of foreground unit process data is considered to be high. All background data are sourced from MLC databases with the documented completeness.

Consistency and Reproducibility

Consistency: To ensure data consistency, all primary data were collected with the same level of detail, while all background data were sourced from the MLC databases.

Reproducibility: Reproducibility is supported as much as possible through the disclosure of input-output data, dataset choices, and modeling approaches in this report. Based on this information, any third party should be able to approximate the results of this study using the same data and modeling approaches.

Representativeness

Temporal: All primary data were collected for the year 2023. All secondary data come from the MLC 2024.1 databases and are representative of the years 2020-2023. As the study intended to compare the product systems for the reference year 2023, temporal representativeness is considered to be high.

Geographical: All primary and secondary data were collected specific to the countries or regions under study. Where country-specific or region-specific data were unavailable, proxy data were used. Geographical representativeness is considered to be high.

Technological: All primary and secondary data were modeled to be specific to the technologies or technology mixes under study. Where technology-specific data were unavailable, proxy data were used. Technological representativeness is considered to be high.

2.7. Period under Review

Primary data collected represent production during the 2023 calendar year. This analysis is intended to represent production in 2023.

2.8. Allocation

Allocation of background data

Allocation of background data (energy and material) taken from the MLC 2024 databases is documented online at https://lcadatabase.sphera.com/dataset-documentation-download/.

Allocation in the foreground data

For this study, no co-product was present at any facility; therefore, no allocation was conducted. The data for cold-formed steel from each facility is provided separately.

2.9. Comparability

Comparison of the environmental performance of cold-formed steel framing products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under this PCR.

3. Life Cycle Assessment Scenarios

In accordance with the UL Part B Product Category Rules (PCR) for Designated Steel Construction Products and ISO 21930:2017, this EPD covers only modules A1-A3. While biogenic carbon removal from the product is reported, biogenic carbon emissions (BCEK) occur in later life-cycle stages (such as module A5 for packaging disposal or modules C3/C4 for product end-of-life).

Since these later modules are outside the declared system boundary, BCEK values are reported as zero in A1-A3 per PCR guidelines. However, in alignment with ISO 21930, it is assumed that all sequestered biogenic carbon will eventually be released, maintaining a net-zero balance over the full life cycle. This approach ensures transparent and standardized reporting, providing a clear understanding of biogenic carbon flows beyond the scope of this EPD.

Table 1. Carbon Emissions and Removals

PARAMETER	UNIT	A1	A2	A3	TOTAL (A1-A3)
BCRK	kg CO2 eq	0.00E+00	0.00E+00	4.45E+00	4.45E+00
BCEK	kg CO2 eq	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRP	kg CO2 eq	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	kg CO2 eq	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	kg CO2 eq	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	kg CO2 eq	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	kg CO2 eq	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	kg CO2 eq	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4. Life Cycle Assessment Results

Table 2. Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

4.1. Life Cycle Impact Assessment Results

The weighted average life cycle impact assessment and inventory results are mentioned in this section. Tabulated results are followed by contribution analyses of steel product for each region, to provide a sense of which modules are driving environmental burden.

Module A1 (raw materials) contributes the most to every impact category (50% to 99%), followed by A2 (transportation) (2% to 20%) and A3 (manufacturing) (1% to 30%). Within A1 module, steel contribute the most (93%) followed by manufacturing energy and transport. The figure below shows the total A1-A3 results.

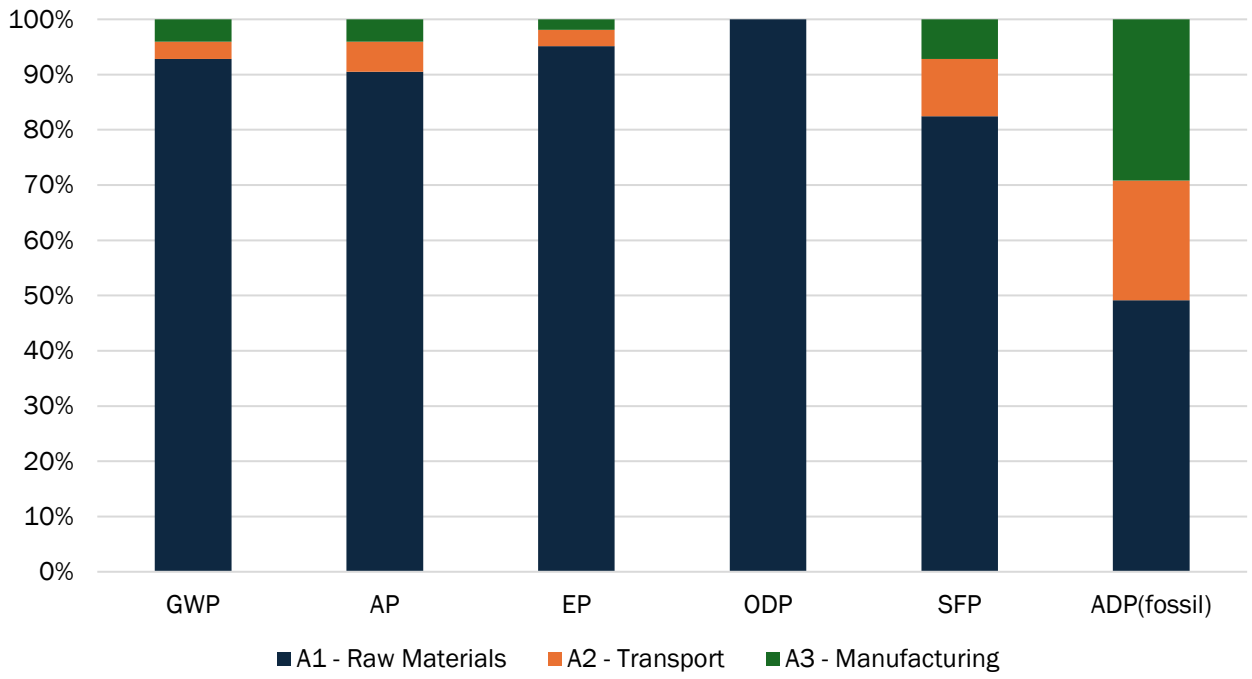


Figure 3: Cradle-to-gate life cycle impact results

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Table 3. North American Impact Assessment Results

TRACI v2.1	A1	A2	A3	TOTAL (A1-A3)
GWP100 [kg CO_2 eq]	1.34E+03	4.55E+01	5.87E+01	**1.45E+03**
ODP [kg CFC-11 eq]	1.32E-05	1.29E-13	1.74E-12	**1.32E-05**
AP [kg SO_2 eq]	4.73E+00	2.84E-01	2.12E-01	**5.22E+00**
EP [kg N eq]	7.40E-01	2.31E-02	1.46E-02	**7.77E-01**
SFP [kg O_3 eq]	7.51E+01	9.44E+00	6.53E+00	**9.11E+01**
ADP_{fossil} [MJ, LHV]	1.30E+03	5.73E+02	7.70E+02	**2.64E+03**

These six 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. Global warming potential (GWP) excludes biogenic carbon.

4.2. Life Cycle Inventory Results

Table 4. Resource Use

PARAMETER	A1	A2	A3	TOTAL (A1-A3)
RPR_E [MJ, LHV]	9.09E+02	2.56E+01	1.40E+02	**1.07E+03**
RPR_M [MJ, LHV]	0.00E+00	0.00E+00	4.35E+01	**4.35E+01**
RPR_T [MJ, LHV]	9.09E+02	2.56E+01	1.83E+02	**1.12E+03**
$NRPR_E$ [MJ, LHV]	1.81E+04	5.78E+02	9.34E+02	**1.96E+04**
$NRPR_M$ [MJ, LHV]	4.11E+02	0.00E+00	1.75E+01	**4.28E+02**
$NRPR_T$ [MJ, LHV]	1.85E+04	5.78E+02	9.52E+02	**2.00E+04**
SM [kg]	8.08E+02	0.00E+00	0.00E+00	**8.08E+02**
RSF [MJ, LHV]	-	-	-	**-**
NRSF [MJ, LHV]	-	-	-	**-**
RE [MJ, LHV]	-	-	-	**-**
FW [m^3]	7.65E+00	8.50E-02	1.60E-01	**7.90E+00**

Table 5. Output Flows and Waste Categories

PARAMETER	A1	A2	A3	TOTAL (A1-A3)
HWD [kg]	1.09E+01	0.00E+00	4.56E-01	**1.14E+01**
NHWD [kg]	3.58E+01	0.00E+00	0.00E+00	**3.58E+01**
HLRW [kg] or [m^3]	7.93E-04	2.07E-06	7.70E-05	**8.72E-04**
ILLRW [kg] or [m^3]	6.65E-01	1.74E-03	6.43E-02	**7.31E-01**
CRU [kg]	-	-	-	**-**
MFR [kg]	7.43E+02	0.00E+00	7.10E+01	**8.14E+02**
MER [kg]	0.00E+00	0.00E+00	4.56E-01	**4.56E-01**
EE [MJ, LHV]	-	-	-	**-**

Table 6. Variations in LCIA impact categories and indicators between three facilities

INDICATOR	UNIT	FACILITY COUNT	MIN	MAX	MAX/MIN RATIO	MEAN	WEIGHTED AVERAGE	PERCENTAGE E-VARIATION
GWP 100	kg CO2 eq	3	1.39E+03	1.61E+03	1.16E+00	1.48E+03	1.45E+03	14%
ODP	kg CFC-11 eq	3	3.25E-06	2.15E-05	6.62E+00	1.24E-05	1.32E-05	85%
AP	kg SO2 eq	3	5.01E+00	5.71E+00	1.14E+00	5.33E+00	5.22E+00	12%
EP	kg N eq	3	2.64E-01	1.56E+00	5.91E+00	9.09E-01	7.77E-01	83%
SFP	kg O3 eq	3	8.33E+01	9.95E+01	1.19E+00	9.22E+01	9.11E+01	16%
ADP_{fossil}	MJ	3	2.08E+03	3.71E+03	1.78E+00	2.88E+03	2.64E+03	44%

Table 7. Variations in resource use indicators between three facilities

INDICATOR	UNIT	FACILITY COUNT	MIN	MAX	MAX/MIN RATIO	MEAN	WEIGHTED AVERAGE	PERCENTAGE E-VARIATION
RPRE	MJ, LHV	3	1.03E+03	1.17E+03	1.14E+00	1.09E+03	1.07E+03	12%
RPRM	MJ, LHV	3	1.05E+01	1.21E+01	1.16E+00	4.70E+01	4.35E+01	13%
RPRT	MJ, LHV	3	1.07E+03	1.24E+03	1.15E+00	1.14E+03	1.12E+03	14%
NRPRE	MJ, LHV	3	3.88E+02	4.79E+02	1.23E+00	2.01E+04	1.96E+04	19%
NRPRM	MJ, LHV	3	1.94E+04	2.21E+04	1.14E+00	4.31E+02	4.28E+02	12%
NRPRT	MJ, LHV	3	7.82E+02	8.80E+02	1.13E+00	2.05E+04	2.00E+04	11%
SM	kg	3	1.03E+03	1.17E+03	1.14E+00	8.23E+02	8.08E+02	12%
RSF	MJ, LHV	3	-	-	-	-	-	-
NRSF	MJ, LHV	3	-	-	-	-	-	-
RE	MJ	3	-	-	-	-	-	-
FW	m^3	3	4.97E+00	9.94E+00	2.00E+00	7.88E+00	7.90E+00	50%

Table 8. Variations in output flows and waste categories between three facilities

INDICATOR	UNIT	FACILITY COUNT	MIN	MAX	MAX/MIN RATIO	MEAN	WEIGHTED AVERAGE	PERCENTAGE E-VARIATION
HWD	kg	3	1.05E+01	1.21E+01	1.16E+00	1.15E+01	1.13E+01	13%
NHDW	kg	3	3.15E+01	4.10E+01	1.30E+00	3.62E+01	3.58E+01	23%
HLRW	kg	3	7.48E-04	1.00E-03	1.34E+00	8.91E-04	8.72E-04	25%
ILLRW	kg	3	6.27E-01	8.39E-01	1.34E+00	7.47E-01	7.31E-01	25%
CRU	kg	3	-	-	-	-	-	-
MFR	kg	3	7.26E+02	9.03E+02	1.24E+00	8.28E+02	8.14E+02	20%
MER	kg	3	2.49E-01	5.89E-01	2.37E+00	4.60E-01	4.56E-01	58%
EE	MJ, LHV	3	-	-	-	-	-	-

5. LCA Interpretation

The results represent the cradle-to-gate environmental performance of 1 metric ton of cold-formed steel products and the packaging associated with it.

Module A1 (raw materials) contributes the most to every impact category (50% to 99%), followed by A2 (transportation) (2% to 20%) and A3 (manufacturing) (1% to 30%).

For GWP100, steel represents the largest contribution (93%), followed by manufacturing energy (4%) and transport (3%).

Waste management, which includes transport of waste material to recovery or disposal, and relevant waste processing makes negligible contributions to overall production phase impacts.

6. Supporting Documentation

Additional information Safety Data Sheets (SDS) and Health Product Declarations (HPD) may be found at https://www.marinoware.com/resources/sds/.

7. References

1. Sphera. (2024). EPD Background Report of EAF Cold Formed Metal Framing Products.
2. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
3. ISO 14040: 2006 Environmental Management – Life cycle assessment – Principles and Framework
4. ISO 14044: 2006/AMD 1:2017/ AMD 2:2020 Environmental Management – Life cycle assessment – Requirements and Guidelines.
5. ISO 21930: 2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.
6. Sphera Managed LCA Content Database. October 2024.
7. UL Environment. (2022). Part A: Life Cycle Assessment Calculation Rules and Report Requirements, Version 4.0.
8. UL Environment. (2020). Part B: Designated steel Construction Product EPD Requirements, Version 2.0.
9. UL Environment. (2020). UL Environmental General Program Instructions, Version 2.5.