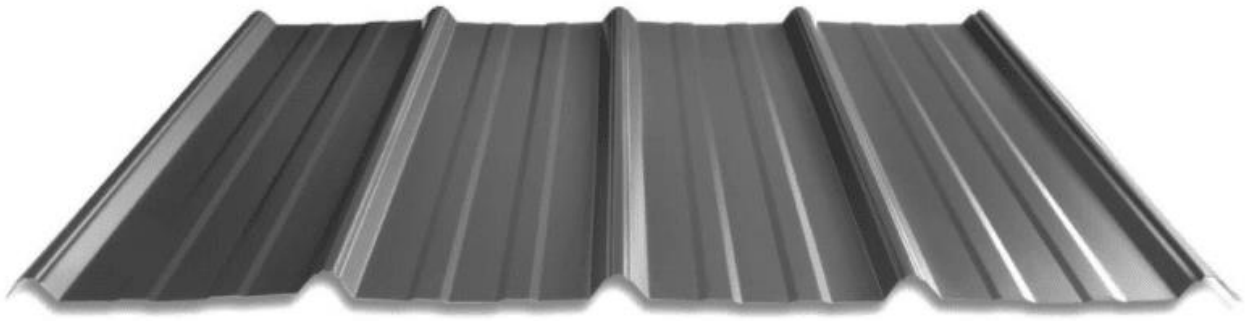
Environmental Product Declaration



Environmental Product Declaration for metal panel products produced by Taylor Metal Products at their facility in Salem, Oregon

ADMINISTRATIVE INFORMATION

International Certified Environmental Product Declaration

Declared Product:	This Environmental Product Declaration (EPD) covers metal panel products produced by Taylor Metal Products. Declared unit: 100 m2 of Average Metal Panel Product
Declaration Owner:	Taylor Metal Products 4566 Ridge Dr NE Salem, Oregon, USA www.taylormetal.com
Program Operator:	Labeling Sustainability Address, 11670 W Sunset Blvd. Los Angeles, CA 90049 www.labelingsustainability.com
Product Category Rule:	ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction product and services and Sub Product Category Rule Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels. PCR Program Operator: UL PCR review was conducted by: Thomas Gloria, PhD (chair); Lindita Bushi, PhD; Bob Zabcik, P.E., LEED AP BD+C
Independent LCA Reviewer and EPD Verifier:	This declaration was independently verified in accordance with ISO 14025:2006 Independent verification of the declaration, according to ISO 14025:2006 External X Third Party Verifier Geoffrey Guest, Certified 3rd Party Verifier under Labeling Sustainability Program (www.labelingsustainability.com), CSA Group (www.csaregistries.ca)
Date of Issue:	12 June 2024
Period of Validity:	5 years; valid until 12 June 2029
EPD Number:	F73eab7a-e72c-4c53-9602-3e6c14444ef8

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COMPANY DESCRIPTION

Taylor Metal Products is a leading and prominent sheet metal panel manufacturer and is committed to supplying contractors with the most modern, high-quality metal roofs in the industry. Residential metal roofing has been its specialty since 1985. Furthermore, Taylor Metal offers a wide range of metal roofing and metal siding supplies for residential, commercial, and agricultural applications. Taylor Metal products effectively mitigate solar heat absorption, resulting in reduced cooling energy consumption and enhanced sustainability.

STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, www.labelingsustainability.com. . This level of study is in accordance with EPD Product Category Rule (PCR) for Metal Panel published by UL Environment entitled, 'Guidance for Building-Related Products and Services, Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding EPD Requirements'; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate Taylor Metal Products from their competition for the following reasons: generate an advantage for the organization; offer customers information to help them make informed product decisions; improve the environmental performance of Taylor Metal Products by continuously measuring, controlling and reducing the environmental impacts of their products; help project facilitators working on Leadership in Energy and Environmental Design (LEED) projects achieve their credit goal; and to strengthen Taylor Metal Products' license to operate in the community. The intended audience for this LCA report is Taylor Metal Products' employees, their suppliers, project specifiers of their products, architects, and engineers. The EPD report is also available for policy makers, government officials interested in sustainability, academic professors, and LCA professionals. This LCA report does not include product comparisons from other facilities.

DESCRIPTION OF PRODUCT AND SCOPE

As specified by the PCR, the declared unit for metal panels is the coverage of 100 square meters (1076.4 square feet) of building area. The coverage area represents the total flat area covered by the installed products and does not account for losses resulting from overlapping or scrap during installation.

Table 1: **Declared Unit.**

Name	Value	Unit
Declared unit	100	m2 of coverage
Product mass	41-1204	kg per 100 m2

Metal panels are available in a range of gauges and sizes, fabricated from aluminum and steel, featuring a variety of finish and paint options. The technical properties of metal panel products discussed in this study are outlined in the table below.

Table 2: **Technical Data: Standing Seam Metal Panels, Exposed Fastener Panels, and Concealed Fastener Siding.**

Parameter	Value	Unit
Length	1.32 - 9.57	ft
Width	12 - 48.38	inch
Thickness	0.59 - 0.86	mm
Density	2740 - 7842	kg/m3
Weight	0.08 - 2.47	lb /sq. ft
Modulus of Elasticity	70000 - 200000	MPa

This EPD reports on various metal roofing panels and siding, including Standing Seam Metal Panels, Exposed Fastener Panels, and Concealed Fastener Siding manufactured at the Taylor Metal Products facility situated in Salem, Oregon.

This LCA assumes the impacts from products manufactured in accordance with the standards outlined in this report. This LCA is a cradle-to-gate study, and therefore, stages extending beyond the plant gate are not included in this LCA. Excluded stages include transportation of the manufactured material to the construction site; on-site construction processes and components; building (infrastructure) use and maintenance; and "end-of-life" effects.

METAL PANEL DESIGN SUMMARY

The following tables provide a list of the metal panel products considered in this EPD along with key performance parameters.

Table 3: **Declared products with All declared products considered in this environmental product declaration**

Prod#	Unique name/ID	Short description	Unit	Density, dry kg/Unit	bio-carbon content, kg C/FU dry basis
1	Standing Seam Panel (Painted Galvanized)	Average Mechanical/Snap Seam Panels	100 m2	460.01	0
2	Standing Seam Panel (Painted Zincalume)	Average Mechanical/Snap Seam Panels	100 m2	439.49	0

3	Standing Seam Panel (Painted Aluminum)	Average Mechanical/Snap Seam Panels	100 m2	189.16	0
4	Exposed Fastener Panel (Painted Galvanized)	Average Exposed Fastener Panels	100 m2	330.22	0
5	Exposed Fastener Panel (Painted Zincalume)	Average Exposed Fastener Panels	100 m2	315.49	0
6	Exposed Fastener Panel (Painted Aluminum)	Average Exposed Fastener Panels	100 m2	135.79	0
7	Concealed Fastener Siding (Painted Galvanized)	Average Concealed Fastener Panels	100 m2	293.19	0
8	Concealed Fastener Siding (Painted Zincalume)	Average Concealed Fastener Panels	100 m2	280.11	0
9	Concealed Fastener Siding (Painted Aluminum)	Average Concealed Fastener Panels	100 m2	120.57	0

Prod#	Unique name/ID	Thickness (cm)	Length (cm)	Width (cm)
1	Standing Seam Panel (Painted Galvanized)	0.059 & 0.086	Various dimensions	Various dimensions
2	Standing Seam Panel (Painted Zincalume)	0.059 & 0.086	Various dimensions	Various dimensions
3	Standing Seam Panel (Painted Aluminum)	0.081	Various dimensions	Various dimensions
4	Exposed Fastener Panel (Painted Galvanized)	0.059 & 0.086	Various dimensions	Various dimensions
5	Exposed Fastener Panel (Painted Zincalume)	0.059 & 0.086	Various dimensions	Various dimensions
6	Exposed Fastener Panel (Painted Aluminum)	0.081	Various dimensions	Various dimensions
7	Concealed Fastener Siding (Painted Galvanized)	0.059 & 0.086	Various dimensions	Various dimensions
8	Concealed Fastener Siding (Painted Zincalume)	0.059 & 0.086	Various dimensions	Various dimensions
9	Concealed Fastener Siding (Painted Aluminum)	0.081	Various dimensions	Various dimensions

METAL PANEL DESIGN COMPOSITION

The following figures provide mass breakdown (kg per functional unit) of the material composition of each metal panel design considered.

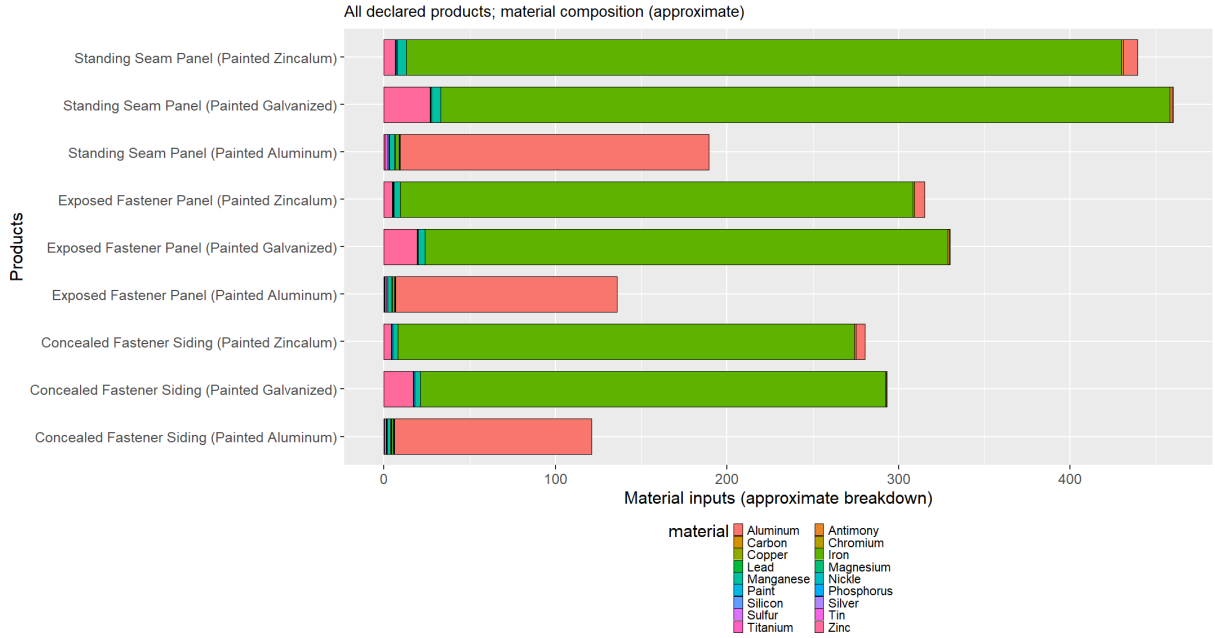

Figure 1: **Material composition - All declared products per 100 m2 of Average Metal Panel Product**

A1 RAW MATERIAL RECYCLED CONTENT AND MATERIAL LOSSES

The following table provides a list of the raw material inputs (module A1) across all products considered, their recyclability content and assumed material losses.

Table 4: **Module A1 raw material inputs, the recyclability content and assumed material losses (dry basis)**

Product.Name	Mix.Category	Primary.Content	Post.Industrial. Content	Post.Consumer .Content	Material.Losses
Recycled steel (galvanized)	steel, low-alloyed	0%	35%	25%	2%
Primary steel (galvanized)	steel, low-alloyed	100%	0%	0%	2%
Recycled steel (Zincalume)	steel, low-alloyed	0%	35%	25%	2%
Primary steel (Zincalume)	steel, low-alloyed	100%	0%	0%	2%
Galvanized coating	zinc coat, coils	100%	0%	0%	2%
Zincalume coating	zinc coat, coils	100%	0%	0%	2%
Primary aluminum	aluminium, primary, ingot	100%	0%	0%	2%
Aluminium	aluminium alloy, AlMg3	0%	35%	20%	2%
Paint (for galvanized & Zincalume)	polyvinylfluoride	100%	0%	0%	2%

Paint (for aluminium)	polyvinylfluoride	100%	0%	0%	2%

SYSTEM BOUNDARIES

The following figure depicts the cradle-to-grave system boundary considered in this study:

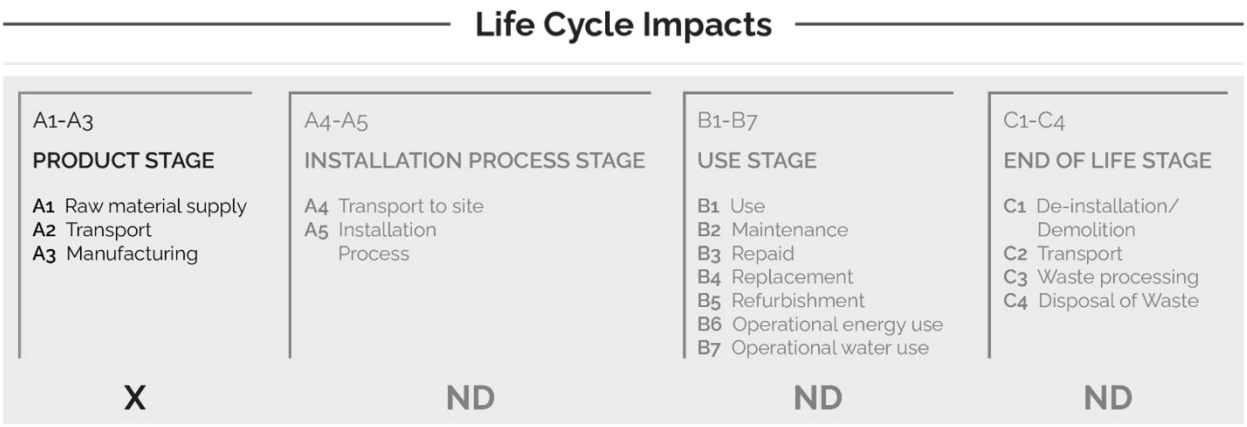

Figure 2: **General life cycle phases for consideration in a construction works system.**

This is a Cradle-to-gate life cycle assessment and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared products in this LCA.
- A2: Transportation - Transportation of A1 materials from the supplier to the "gate" of the manufacturing facility (i.e. A3).
- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move, and manufacturer the declared products and to operate the facility.

According to the PCR, the following figure illustrates the general activities and input requirements for producing metal panel products and is not necessarily exhaustive.

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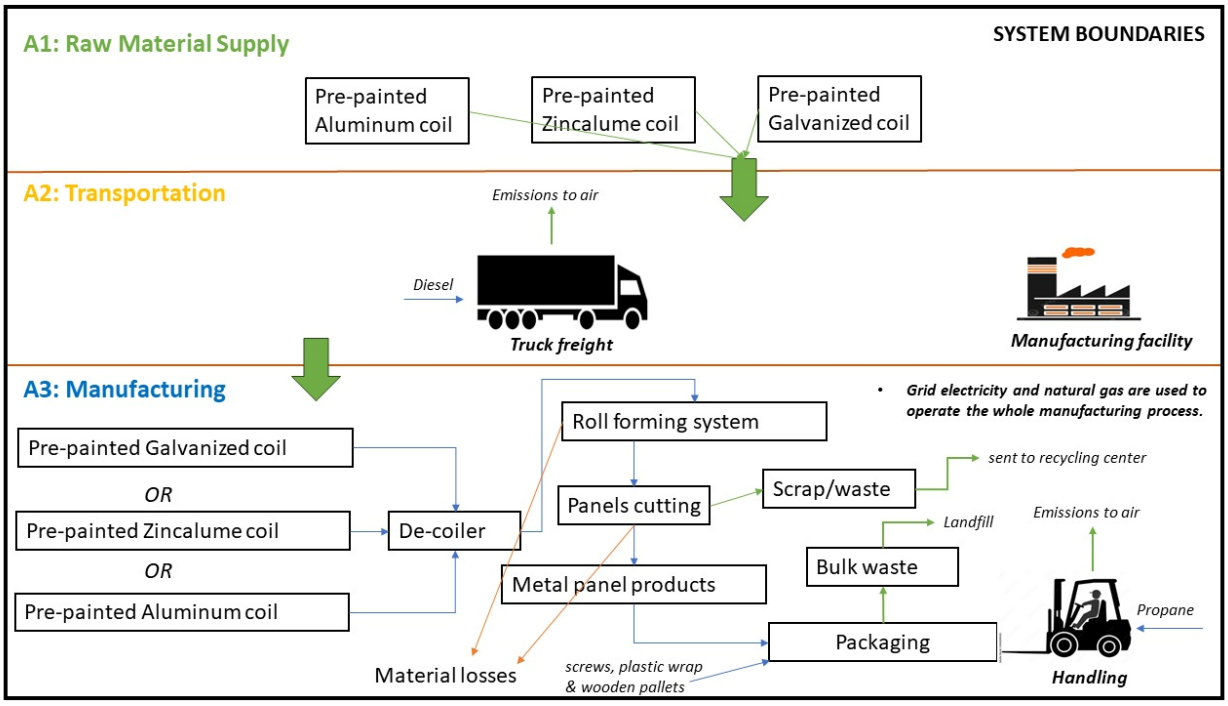

Figure 3: **General system inputs considered in the product system and categorized by modules in scope**

In addition, as according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture and construction of A3 building/capital goods and infrastructure;
- Production and manufacture of steel production equipment, steel delivery vehicles, earth-moving equipment, and laboratory equipment;
- Personnel-related activities (travel, furniture, office supplies);
- Energy use related to company management and sales activities.

For this LCA the manufacturing plant, owned and operated by Taylor Metal Products, is located at their Salem OR facility in Oregon, USA. All operating data is formulated using the actual data from Taylor Metal Products' plant at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet and was then input into an RStudio environment where pre-calculated LCIA results for relevant products/activities stemming from the ecoinvent v3.10 database and a local EPD database in combination with primary data from Taylor Metal Products were utilized. Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality'. Further LCI details for each declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A parameter uncertainty analysis was also performed where key statistical results (e.g. min/mean/max etc.) are provided in the detailed LCA report.

No known flows are deliberately excluded from this EPD.

CUT-OFF CRITERIA

ISO 14044:2006 and the focus PCR requires the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above as follows. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the total of the neglected inputs does not exceed 5%.

DATA SOURCES AND DATA QUALITY ASSESSMENT

No recovered on-site energy occurs at this facility.

Table 5: **Reused or recycled components/materials at the A3 facility site**

Component/material for re-use/recycling	Value	Units	Re-used/recycled on-site or off-site
Steel scrap	56517.774	kg	Off-site
Aluminum scrap	6985.343	kg	Off-site

The following statements explain how the above facility requirements/generation were derived:

Raw material transport: Taylor Metal provided all the raw material data for the reference year 2023. Raw material transportation is based on the actual distance from the manufacturer's/distributor's location. The transportation was reported using Taylor Metals' primary data which consisted of the actual distance, mode of transport, and location in the city, state, and country. The transportation of raw materials within the United States exclusively relies on truck freight as the primary mode of transportation.

Electricity: The reported electricity consumption is based on the Taylor Metal primary information from utility bills for the reporting period. Electricity usage allocation was initially determined by calculating the product percentage of each panel type relative to the sales volume. Subsequently, the resulting sales percentage values were then multiplied by the total electricity consumption. Thus, giving a specific value for each panel type to the overall electricity consumption.

Process/space heating: The facility incorporates natural gas within its production processes. The reported consumption of natural gas is based on Taylor Metal's primary information derived from utility bills for the reporting period. The conversion factor used for MMBtu to MJ to represent the natural gas heating values in Mega joules (MJ) was, 1 MMBtu equating to 1055.055 MJ.

Fuel required for machinery: Taylor Metal uses propane to move materials in their facility. Primary data was gathered from the vendor bills for the propane tanks. For propane, the conversion factor was determined as 1m3 of propane = 93.1 MJ of energy.

Waste generation: Waste calculations were calculated using primary information from Taylor Metal's records or vendor bills, which includes bulk waste only. No other waste is associated with the product because all the scrap/waste is generated during the manufacturing process, as every single material is consumable and can be re-processed as a constituent in another manufacturing process. Transportation defaults were used because the driver's route and ultimate final destination are unknown. Therefore, the exact mileage could not be confirmed by the waste hauler.

Recovered energy: No on-site energy is recovered on site.

Recycled/reused material/components: All the scrap or waste generated during the manufacturing process at the facility is used as a constituent in another manufacturing process.

Module A1 material losses: Default material losses, 2%, were used.

Direct A3 emissions accounting: Direct emissions were modeled with the best available ecoinvent processes (see LCI list).

The following tables depict a list of assumed life cycle inventory utilized in the LCA modeling to generate the impact results across the life cycle modules in scope. An assessment of the quality of each LCI activities utilized from various sources is also provided.

Table 6: **LCI inputs assumed for module A1 (i.e. raw material supply)**

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Recycled steel (galvanized)	steel production, electric, low-alloyed/steel, low-alloyed/RoW/kg	ecoinvent v3.10 in 2024	Oregon	2024	2	3	2	3	3
Primary steel (galvanized)	steel production, converter, low-alloyed/steel, low-alloyed/RoW/kg	ecoinvent v3.10 in 2024	Oregon	2024	2	3	2	3	3
Base aluminum	aluminum production, primary, ingot/aluminum, primary, ingot/RoW/kg	ecoinvent v3.10 in 2024	California	2024	1	3	1	3	3
Paint (for galvanized & Zincalume)	polyvinyl fluoride production/polyvinyl fluoride/RoW/kg	ecoinvent v3.10 in 2024	Oregon	2024	2	3	2	3	3
Recycled aluminum	aluminum alloy production, AlLi/aluminum alloy, AlLi/RoW/kg	ecoinvent v3.10 in 2024	California	2024	2	3	2	3	3
Galvanized coating	zinc coating, coils/zinc coat, coils/RoW/m2	ecoinvent v3.10 in 2024	Oregon	2024	2	3	2	3	3

Table 7: **LCI inputs assumed for module A2 (i.e. transport of A1 inputs)**

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Base aluminum-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Bulk waste-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Paint (for aluminum)-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Paint (for galvanized & Zincalume)-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Plastic wrap-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Primary steel (galvanized)-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3

Primary steel (Zincalume)-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Recycled aluminum-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Recycled steel (galvanized)-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Recycled steel (Zincalume)-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Screw-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Waste for recycling-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3

Table 8: **LCI inputs assumed for module A3**

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Bulk waste	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	ecoinvent v3.10 in 2024	Oregon	2024	2	3	1	3	3
Electricity	market for electricity, medium voltage/electricity, medium voltage/US-WECC/kWh	ecoinvent v3.10 in 2024	Multiple states	2024	2	3	2	3	3
Natural gas	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	ecoinvent v3.10 in 2024	Multiple states	2024	2	3	2	3	3
Pallet	EUR-flat pallet production/EUR-flat pallet/RoW/unit	ecoinvent v3.10 in 2024	Oregon	2024	2	3	1	3	3
Plastic wrap	extrusion, plastic film/extrusion, plastic film/RoW/kg	ecoinvent v3.10 in 2024	Oregon	2024	2	3	1	3	3
Propane	propane, burned in building machine/propane, burned in building machine/GLO/MJ	ecoinvent v3.10 in 2024	Oregon	2024	2	3	2	3	3
Screw	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	ecoinvent v3.10 in 2024	Oregon	2024	1	3	1	3	3
Waste for recycling	waste/scrap to sorting center for recycling	Original facility data	Original facility data	Original facility data: 2023-01-01 to 2023-12-31	1	3	2	3	3

DATA QUALITY ASSESSMENT

Data quality/variability requirements, as specified in the PCR, are applied. This section describes the achieved data quality relative to the ISO 14044:2006 requirements. Data quality is judged based on its precision (measured, calculated or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied within a study serving as a data source) and representativeness (geographical, temporal, and technological).

Precision: Through measurement and calculation, the manufacturers collected and provided primary data on their annual production. For accuracy, the LCA practitioner and 3rd Party Verifier validated the plant gate-to-gate data.

Completeness: All relevant specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled to represent the specified and declared products. The majority of relevant background materials and processes were taken from ecoinvent v3.10 LCI datasets where relatively recent region-specific electricity inputs were utilized. The most relevant EPDs requiring key A1 inputs were also utilized where readily available.

Consistency: To ensure consistency, the same modeling structure across the respective product systems was utilized for all inputs, which consisted of raw material inputs and ancillary material, energy flows, water resource inputs, product and co-products outputs, returned and recovered Metal Panel materials, emissions to air, water and soil, and waste recycling and treatment. The same background LCI datasets from the ecoinvent v3.10 database were used across all product systems. Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the plant and selected process level to maintain a high level of consistency.

Reproducibility: Internal reproducibility is possible since the data and the models are stored and available in a machine-readable project file for all foreground and background processes, and in Labeling Sustainability's proprietary Metal Panel LCA calculator* for all production facility and product-specific calculations. A considerable level of transparency is provided throughout the detailed LCA report as the specifications and material quantity make-up for the declared products are presented and key primary and secondary LCI data sources are summarized. The provision of more detailed publicly accessible data to allow full external reproducibility was not possible due to reasons of confidentiality.

*Labeling Sustainability has developed a proprietary tool that allows the calculation of PCR-compliant LCA results for Metal Panel product designs. The tool auto-calculates results by scaling base-unit technosphere inputs (i.e. 1 kg sand, 1 kWh electricity, etc.) to replicate the reference flow conversions that take place in any typical LCA software like openLCA or SimaPro. The tool was tested against several LCAs performed in openLCA and the tool generated identical results to those realized in openLCA across every impact category and inventory metric (where comparisons could be readily made).

Representativeness: The representativeness of the data is summarized as follows.

- Time related coverage of the manufacturing processes' primary collected data from 2023-01-01 to 2023-12-31.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets as found in the country-adjusted ecoinvent v3.10 database.
- Geographical coverage for inputs required by the A3 facility(ies) is representative of its region of focus; other upstream and background processes are based on US, North American, or global average data and adjusted to regional electricity mixes when relevant.
- Technological coverage is typical or average and specific to the participating facilities for all primary data.

ENVIRONMENTAL INDICATORS AND INVENTORY METRICS

Per the PCR, this EPD supports the life cycle impact assessment indicators and inventory metrics as listed in the tables below. As specified in the PCR, the most recent US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), impact categories were utilized as they provide a North American context for the mandatory category indicators to be included in the EPD. Additionally, the PCR requires a set of inventory metrics to be reported with the LCIA indicators (see tables below).

Table 9: **Life cycle impact categories and life cycle inventory metrics**

ID	LCIA.indicators	Abbreviations	Units
1	Climate change: global warming potential (GWP100)	GWP100	kg CO2-eq
2	Ozone depletion: ozone depletion potential (ODP)	ODP	kg CFC-11-eq
3	Acidification: acidification potential (AP)	AP	kg SO2-eq
4	Eutrophication: eutrophication potential	EP	kg N-eq
5	Smog formation potential	SFP	kg O3-eq
6	Energy resources: non-renewable: abiotic depletion potential (ADP): fossil fuels	ADPfossil	MJ
Inventory metrics			
7	Inventory indicators ISO21930: Cumulative Energy Demand - renewable energy resources	RPRE	MJ
8	Inventory indicators ISO21930: Renewable primary resources with energy content used as material (i.e., PERM)	PRM	MJ
9	Inventory indicators ISO21930: Cumulative Energy Demand - non-renewable energy resources	NRPRE	MJ
10	Inventory indicators ISO21930: Non-renewable primary resources with energy content used as material (i.e., PENRM)	NRPRM	kg
11	Inventory indicators ISO21930: use of secondary material	SM	MJ
12	Inventory indicators ISO21930: use of renewable secondary fuels	RSF	MJ
13	Inventory indicators ISO21930: recovered energy	RE	MJ
14	Inventory indicators ISO21930: use of net fresh water	FW	m3
15	Inventory indicators ISO21930: hazardous waste disposed	HWD	kg
16	Inventory indicators ISO21930: non-hazardous waste disposed	NHWD	kg

17	Inventory indicators ISO21930: high-level radioactive waste disposed	HLRW	kg
18	Inventory indicators ISO21930: intermediate and low-level radioactive waste disposed	ILLRW	kg
19	Inventory indicators ISO21930: materials for recycling	MR	kg
20	Inventory indicators ISO21930: materials for energy recovery	MER	kg
21	Inventory indicators ISO21930: exported energy - electricity	EEel	MJ
22	Inventory indicators ISO21930: exported energy - heat	EEheat	MJ

It should be noted that emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

- Renewable primary energy resources as energy (fuel);
- Renewable primary resources as material;
- Non-renewable primary resources as energy (fuel);
- Non-renewable primary resources as material;
- Secondary Materials;
- Renewable secondary fuels;
- Non-renewable secondary fuels;
- Recovered energy;
- Abiotic depletion potential for non-fossil mineral resources.
- Land use related impacts, for example on biodiversity and/or soil fertility;
- Toxicological aspects;
- Emissions from land use change [GWP 100 (land-use change)];
- Hazardous waste disposed;
- Non-hazardous waste disposed;
- High-level radioactive waste;
- Intermediate and low-level radioactive waste;
- Components for reuse;
- Materials for recycling;
- Materials for energy recovery;
- Recovered energy exported from the product system.

TOTAL IMPACT SUMMARY

Interpretation

This study represents sheet metal produced for manufacturing residential and industrial roof panels. Primary Taylor metals data include galvanized primary and recycled steel, paint, electricity fuel consumption, and bulk waste. Stage A2 also includes inbound truck transportation for steel scrap. The most significant contribution to Taylor Metals Salem's carbon footprint, measured in Kg CO_2 eq, was from the raw material, A1. Taylor Metals primarily uses recycled steel and aluminum sheets as the main source for paneling. The most significant A1 contributions include recycled steel and aluminum sheets,

coatings, and paint. Since the largest contribution to the raw material is recycled steel and aluminum, the A2 transportation stage of this recycled material contributes more. The A3 manufacturing stage contributes to the product's overall GWP and global warming potential through the highest single-process contribution of electricity to the product's carbon footprint, with other donations to A3, including hardware and natural gas.

The following table reports the total LCA results for each product produced at the given metal panel facility per 100 m2 of Average Metal Panel Product basis.

Table 10: **Total life cycle (across modules in scope) impact results for All declared products, assuming the geometric mean point values on a per 100 m2 of Average Metal Panel Product basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit	**kg CO2-eq**	**kg CFC-11-eq**	**kg SO2-eq**	**kg N-eq**	**kg O3-eq**	**MJ**
Minimum	680	7.18e-06	8.15	4.41	44	7250
Maximum	2030	1.35e-05	28.7	8.49	144	19000
Mean	1100	9.51e-06	18.2	5.89	74.2	11000
Median	1070	8.58e-06	18.3	5.41	69	11400
Standing Seam Panel (Painted Galvanized)	1090	1.16e-05	28.7	7.09	70.7	11600
Standing Seam Panel (Painted Zincalume)	1070	1.13e-05	27.9	6.92	69	11400
Standing Seam Panel (Painted Aluminum)	2030	1.35e-05	12.8	8.49	144	19000
Exposed Fastener Panel (Painted Galvanized)	784	8.3e-06	20.6	5.09	50.8	8350
Exposed Fastener Panel (Painted Zincalume)	766	8.09e-06	20	4.97	49.6	8160
Exposed Fastener Panel (Painted Aluminum)	1460	9.67e-06	9.18	6.1	103	13600
Concealed Fastener Siding (Painted Galvanized)	696	7.37e-06	18.3	4.52	45.1	7420
Concealed Fastener Siding (Painted Zincalume)	680	7.18e-06	17.8	4.41	44	7250
Concealed Fastener Siding (Painted Aluminum)	1300	8.58e-06	8.15	5.41	91.8	12100

b) Resource Inventory Metrics:

Indicator/LCI Metric	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit	**MJ**	**MJ**	**MJ**	**kg**	**MJ**	**MJ**	**MJ**	**m3**
Minimum	724	0.0315	723	0.144	27.6	0.0405	4.07	1.66
Maximum	1510	0.116	1510	0.549	301	0.0934	9.88	10.3
Mean	995	0.0722	996	0.34	167	0.065	6.78	4.1
Median	961	0.0746	965	0.35	192	0.0635	6.38	2.61
Standing Seam Panel (Painted Galvanized)	1160	0.116	1160	0.549	301	0.0934	9.88	2.74
Standing Seam Panel (Painted Zincalume)	1130	0.111	1130	0.525	295	0.0913	9.64	2.61
Standing Seam Panel (Painted Aluminum)	1510	0.0475	1510	0.226	43.4	0.0635	6.38	10.3
Exposed Fastener Panel (Painted Galvanized)	835	0.0834	834	0.394	216	0.0671	7.09	1.97
Exposed Fastener Panel (Painted Zincalume)	815	0.0797	813	0.377	212	0.0656	6.92	1.87
Exposed Fastener Panel (Painted Aluminum)	1080	0.0343	1090	0.162	31.1	0.0456	4.58	7.41
Concealed Fastener Siding (Painted Galvanized)	742	0.0746	741	0.35	192	0.0596	6.3	1.75
Concealed Fastener Siding (Painted Zincalume)	724	0.0716	723	0.334	188	0.0583	6.14	1.66
Concealed Fastener Siding (Painted Aluminum)	961	0.0315	965	0.144	27.6	0.0405	4.07	6.58

c) Waste/output Inventory Metrics:

Indicator/LCI Metric	HWD	NHWD	HLRW	ILLRW	MR	MER	EEel	EEheat
Unit	kg	kg	kg	kg	kg	kg	MJ	MJ
Minimum	166	2410	0.00398	0.00771	0.313	0.000612	2.33	1.69
Maximum	372	7730	0.00678	0.0151	5.22	0.00293	6.44	3.43
Mean	235	5000	0.00514	0.0104	1.63	0.00177	4.28	2.47
Median	237	4930	0.00474	0.00965	0.491	0.00187	4.1	2.41
Standing Seam Panel (Painted Galvanized)	265	7730	0.00678	0.0124	0.504	0.00293	6.44	3.43
Standing Seam Panel (Painted Zincalume)	260	7580	0.0066	0.0121	0.491	0.00286	6.27	3.35
Standing Seam Panel (Painted Aluminum)	372	3780	0.00625	0.0151	5.22	0.00096	3.66	2.66
Exposed Fastener Panel (Painted Galvanized)	190	5550	0.00487	0.00891	0.361	0.0021	4.62	2.46
Exposed Fastener Panel (Painted Zincalume)	186	5440	0.00474	0.00868	0.352	0.00205	4.5	2.41
Exposed Fastener Panel (Painted Aluminum)	267	2710	0.00449	0.0109	3.75	0.000689	2.63	1.91
Concealed Fastener Siding (Painted Galvanized)	169	4930	0.00432	0.00791	0.321	0.00187	4.1	2.19
Concealed Fastener Siding (Painted Zincalume)	166	4830	0.00421	0.00771	0.313	0.00182	4	2.14
Concealed Fastener Siding (Painted Aluminum)	237	2410	0.00398	0.00965	3.33	0.000612	2.33	1.69

ADDITIONAL ENVIRONMENTAL INFO

No regulated substances of very high concern are utilized on site.

REFERENCES

ISO Standards:

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms
- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
- 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 Environmental Management - Life Cycle Assessment - Requirements and Guidelines
- ISO 14067:2018 Greenhouse Gases – Carbon Footprint of Products – Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary
- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products

EN Standards:

- EN 16757 Sustainability of construction works - Environmental product declarations – Product Category Rules for concrete and concrete elements
- EN 15804 Sustainability of construction works - Environmental product declarations -Core rules for the product category of construction products

Other References:

- UL Environment (2018). Guidance for Building-Related Products and Services, Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels. UL 10010-5, www.ul.com/businesses/environment.
- USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b
- USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b.
- US EPA (2020) Advancing Sustainable Materials Management: 2018 Fact Sheet, https://www.epa.gov/sites/production/files/2021-01/documents/2018_ff_fact_sheet_dec_2020_fnl_508.pdf