Environmental Product Declaration

Insulated Metal Wall and Roof Panels

METL-SPAN®
ENVIRONMENTAL PRODUCT DECLARATION

METL SPAN®
a NUCOR® company

Metl-Span, a Nucor company, one of the largest producers of metal building components in North America. With its groundbreaking, UL-certified, ISO-compliant products, Metl-Span leads the industry in the development of energy-efficient and cost-effective panel systems.

Since its inception, our company has been dedicated to a cleaner, safer environment. As evidence of our leadership in this role, we offer this Environmental Product Declaration, which provides a detailed analysis of our products' environmental manufacturing footprint, based on an ISO-compliant Life Cycle Assessment (LCA).

Metl-Span's LCA measures the impact of its product on the environment during all phases of its life from supply chain, through the manufacturing process, to product use and end of life. ISO LCA standards are applied to accurately report the product's impact on the environment.

Find your earth-friendly products at:
metlspan.com

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

Metl-Span
Insulated Metal Wall and Roof Panels
CF30A, CF42, CFR42

According to ISO 14025, EN 15804, and ISO21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Environment 333 Pfingsten Road Northbrook, Il 60611	https://www.ul.com https://spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v2.7 2022	
MANUFACTURER NAME AND ADDRESS	Metl-Span 1720 Lakepointe Dr Suite 101, Lewisville, TX 75057	
DECLARATION NUMBER	4790478392.101.1	
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	100 m^2	
REFERENCE PCR AND VERSION NUMBER	Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels [UL Environment]	
DESCRIPTION OF PRODUCT APPLICATION/USE	Comprised of a urethane core sandwiched between two pre-finished steel sheets which form a single, all-in-one insulated metal panel used as exterior wall and roof cladding systems, interior ceiling, and partition walls.	
PRODUCT RSL DESCRIPTION (IF APPL.)	N/A	
MARKETS OF APPLICABILITY	North America	
DATE OF ISSUE	July 1, 2022	
PERIOD OF VALIDITY	5 Years	
EPD TYPE	Product-specific, single-company	
EPD SCOPE	Cradle-to-gate	
YEAR(S) OF REPORTED PRIMARY DATA	Fiscal year 2021	
LCA SOFTWARE & VERSION NUMBER	GaBi 10	
LCI DATABASE(S) & VERSION NUMBER	GaBi 2022	
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1	

The PCR review was conducted by:	UL Environment PCR Panel Review epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum, UL Environment
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sphera Solutions Inc
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas P. Gloria, Industrial Ecology Consultants

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.

Metl-Span
Insulated Metal Wall and Roof Panels
CF42 & CFR42

According to ISO 14025,
EN 15804 and ISO 21930:2017

1. Product Definition and Information

1.1. Company Description

Metl-Span® has been the acknowledged leader in insulated metal panels for a variety of building applications since 1968. And we continue to set new standards in technological advancement, design innovation, aesthetic appeal, manufacturing quality, and service excellence. Our five strategically located, state of the art manufacturing facilities today produce a full range of insulated panels for the architectural, commercial/industrial, and cold storage industries, for new and retrofit construction. We offer panels designed specifically for use in walls, roofs and ceilings, in an ever-widening array of colors and finishes, fitments and performance specifications. Our mission is clearly defined: To deliver the highest-quality, most energy-efficient solutions to insulate and protect our world. That means producing panels which meet or exceed the U.S. Green Building Council's criteria for sustainability, reusability, recyclability and other attributes, thereby enabling our customers to qualify for credits in the Leadership in Energy and Environmental Design (LEED) Rating System, leading to Silver, Gold or Platinum certifications.

1.2. Product Description

Metl-Span insulated metal panels (IMPs) consist of foam (typically polyurethane) sandwiched between two sheets of steel or other metal. Several configurations of IMPs exist depending on where and how they are used (e.g. building walls, roofs, cold storage, etc.) and the styling as desired by the architect. Additionally, IMPs can be manufactured either on a continuous or discontinuous manufacturing line.

Two specific IMP products, which are considered representative of common products manufactured at Metl-Span's facilities, are covered by this EPD. Both products have results reported for two blowing agent options (R-152a and R-1234ze):

- **CF42:** 4-inch thick × 42-inch wide insulated metal panels manufactured on a continuous line for wall insulation (CSI 07 42 13.19; UNSPSC 56101905)
- **CFR42:** 4-inch thick × 42-inch wide insulated metal panels manufactured on a continuous line for roof insulation (CSI 07 41 16; UNSPSC 56101905)

Metl-Span panels are comprised of an advance urethane core that is injected between two pre-finished steel sheets, forming a single, all-in-one unit. The result is the most thermally efficient panel available. Finished panels are mounted to the building's framework – outboard of the structural supports – providing continuous insulation with no thermal bridges for maximum thermal efficiency. A flow diagram of IMP production can be found in Section 1.8.

Furthermore, the exterior face sheet of all Metl-Span insulated wall panels is treated with a base primer followed by a premium coating of full-strength 70 percent PVDF fluoropolymer finish (or a siliconized polyester finish, where economy is a primary consideration). Naturally, Metl-Span panels meet or exceed code requirements for foam plastic insulation.

Information for aforementioned products was supplied by five Metl-Span facilities in Texas, Virginia, Indiana, Nevada, and Ontario. LCA results for each product are presented as production averages, weighted by mass of the different locations.

1.3. Applications

Thanks to their excellent insulating and weatherproofing characteristics, as well as their very competitive installed cost, Metl-Span panels are ideally suited to use in walls, ceilings and roofs for commercial, industrial and institutional buildings of virtually any scale, in both new and retrofit construction. Successful applications include manufacturing facilities, warehousing and distribution centers; schools, sports complexes, museums and convention centers; corporate offices, banks and municipal buildings; retailing locations, including auto dealerships; aircraft hangars and service facilities. Significant examples include the architecturally unique Home2Suites Hotel in downtown Chicago, IL, Loudoun Water Treatment facility in Loudoun, Virginia and the Emergency Operations Center in Palm Beach Gardens, FL.

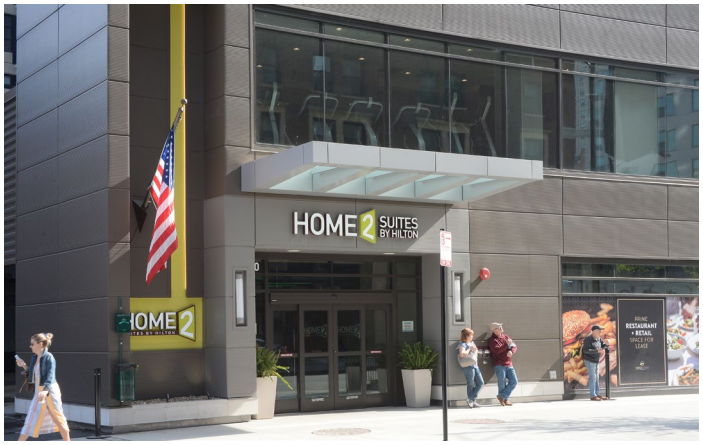


Figure 1: Home2Suites Hotel

Figure 2: Palm Beach Gardens Emergency Operations Center

1.4. Declaration of Methodological Framework

The EPD analysis uses a cradle-to-gate covering product stage, which includes raw material extraction and processing, processing of secondary material, transport to the manufacturer, and manufacturing. The PCR considers installation, use, end-of-life, and recovery stages (Modules A4 through D) as optional. As such, this study excludes the optional stages. Since this is a “cradle-to-gate” study, the products are not declared as fulfilling a building reference service life. This study also excludes construction of captial equipment, including tools used to produce, install and maintain the products; maintenance and operation of support equipment; human labor and commute; building energy consumption; and all other impacts associated with the use stage relative to energy use for the building in which the product is installed. The included and excluded life cycle stages are summarized in Table 11. Additional details on cut-off and allocation procedures are found in sections 2.4 and 2.8, respectively.

1.5. Technical Data

Technical data for IMP products can be found below. Additional product properties can be found in Section 1.6.

AS-TL1923A
ASTM A240
ASTM A653
ASTM A792
ASTM A924
ASTM C273
ASTM C518
ASTM C1363
ASTM D523
ASTM D1014
ASTM D1621
ASTM D1622
ASTM D1623
ASTM D1729
ASTM D2244
ASTM D2794
ASTM D3359
ASTM D4145
ASTM D7091
ASTM E18
ASTM E72
ASTM E90-99
ASTM E283
ASTM E330
ASTM E413
ASTM E1592
ASTM E1680
ASTM E1886
ASTM F1642 FM 4471
FM 4880
FM 4881
GSA-TS01-2003
Florida Department of Business and Professional Regulation - Roof
Florida Department of Business and Professional Regulation - Wall
UL 580
ASCE 7
ASTM A755
ASTM D968

Fire-related standards
ASTM E84
ASTM E119
CAN/ULC S101
CAN/ULC S102
CAN/ULC S126
CAN/ULC S134
CAN/ULC S138

Fire-related standards
NFPA 259
NFPA 285
NFPA 286
UL 263
UL 723

Water-related standards
AAMA 501.1
ASTM D2247
ASTM E331
ASTM E1646

Weathering-related standards
ASTM B117
ASTM D4214
ASTM E1996

1.6. Properties of Declared Product as Delivered

Panels are customized according to building site. Variations in panel configuration are as follows:

CF42 Insulated Metal Wall Panels	
Panel Thickness	**CF Mesa, Light Mesa, Flute:** 2", 2-1/2", 3", 4", 5", 6", 8" **CF Partition:** 2", 2-1/2", 3", 4", 5", 6" (2-3/4" thickness also available from Nevada plant) **CF Tuff-Cast & Tuff Wall:** 2", 2-1/2", 3", 4", 5", 6" **CF Santa Fe & Striated:** 2", 2-1/2", 2-3/4", 3", 4"
Panel Width	**CF Mesa & Light Mesa: 30",** 36", 42" **CF Flute: 42"** **CF Partition:** 44-1/2" **CF Tuff-Cast & Tuff Wall:** 36", 42" **CF Santa Fe & Striated**: 24", 30", 36", 42"
Panel Length	8'-0" up to 53'-0"
Joint Configuration	Offset double tongue and groove with extended metal shelf for positive face fastening
Panel Facings	**Exterior Face:** Stucco-embossed, G-90 galvanized and/or AZ-50 aluminum-zinc coated steel in 26 Ga., 24 Ga., and 22 Ga. **Interior Face:** Stucco-embossed, G-90 galvanized, and/or AZ-50 aluminum-zinc coated steel in 26 Ga., 24 Ga., and 22 Ga.
Orientation	Horizontal or Vertical
CFR42 Insulated Metal Roof Panels	
Panel Thickness	2", 2-1/2", 3", 4", 5", 6"
Panel Width	30", 36", 42"
Panel Length	9'-6" up to 53'-0"
Joint Configuration	Mechanically closed single lock standing seam at the exterior side joint. The interior side joint is a single tongue-and-groove interlock
Panel Facings	**Exterior Face:** Stucco-embossed, G-90 galvanized and/or AZ-50 aluminum-zinc coated steel in 24 Ga. and 22 Ga. **Interior Face:** Stucco-embossed, G-90 galvanized, and/or AZ-50 aluminum-zinc coated steel in 26 Ga., 24 Ga., and 22 Ga.
Orientation	Longitudinal to the Building Width

1.7. Material Composition

Steel coil represents steel that has been rolled out into 22, 24, or 26 gauge sheet and hot-dipped galvanized.

Polyester polyol is one of the primary components of polyurethane and is typically produced by polymerizing propylene oxide and ethylene oxide.

Methylene diphenyl diisocyanate (MDI) is another primary component of polyurethane.

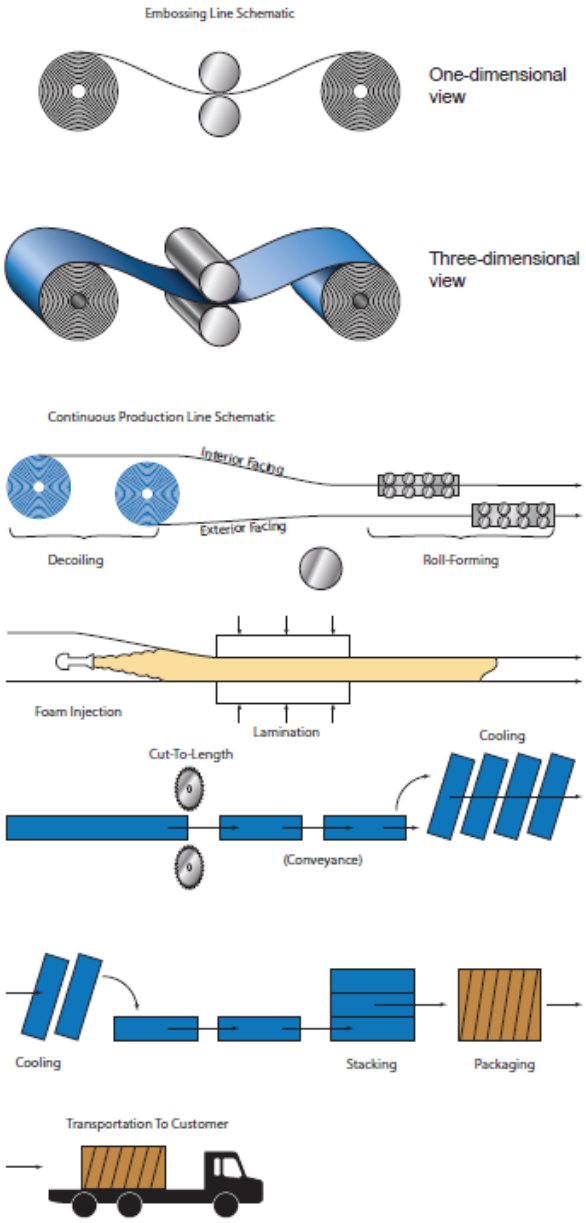
Catalysts are used to balance the reaction between polyester polyol and MDI that produces polyurethane

Table 1: IMP material composition by mass

	CF42	CFR42
Steel	72%	75%
Foam	28%	25%

1.8. Manufacturing

Insulated Metal Panels - Continuous Production Line (CPL)

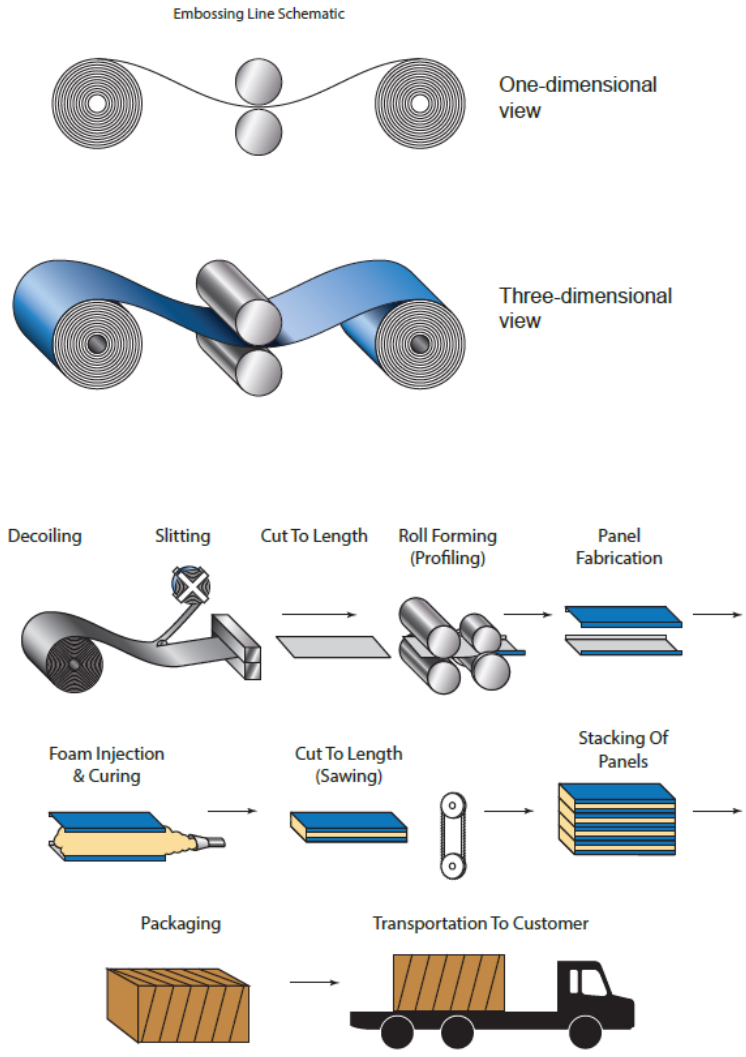


Embossing (off-line) Process	
Process step	**Description**
1	Decoiler
2	Embossing
3	Recoiler

Continuous Production Line (CPL) for Foam Panels	
Process step	**Description**
1	Decoiling of Facings
2	Slitting
3	Rollforming
4	Foam Injection
5	Lamination
6	Saw (Panel Cut to Length)
7	Panel Cooling
8	Bundle Packaging

CPL Unit Process Descriptions	
Metal Fabrication	Metal facings are embossed, trimmed, and rollformed into desired shape.
Foam Injection and Curing	Chemicals are metered and dispensed between two facings into foam and allowed to cure.
Panel Fabrication and Packaging	Panels are cut to size and placed into bundles for delivery

Insulated Metal Panels - Discontinuous Production Line (DPL)



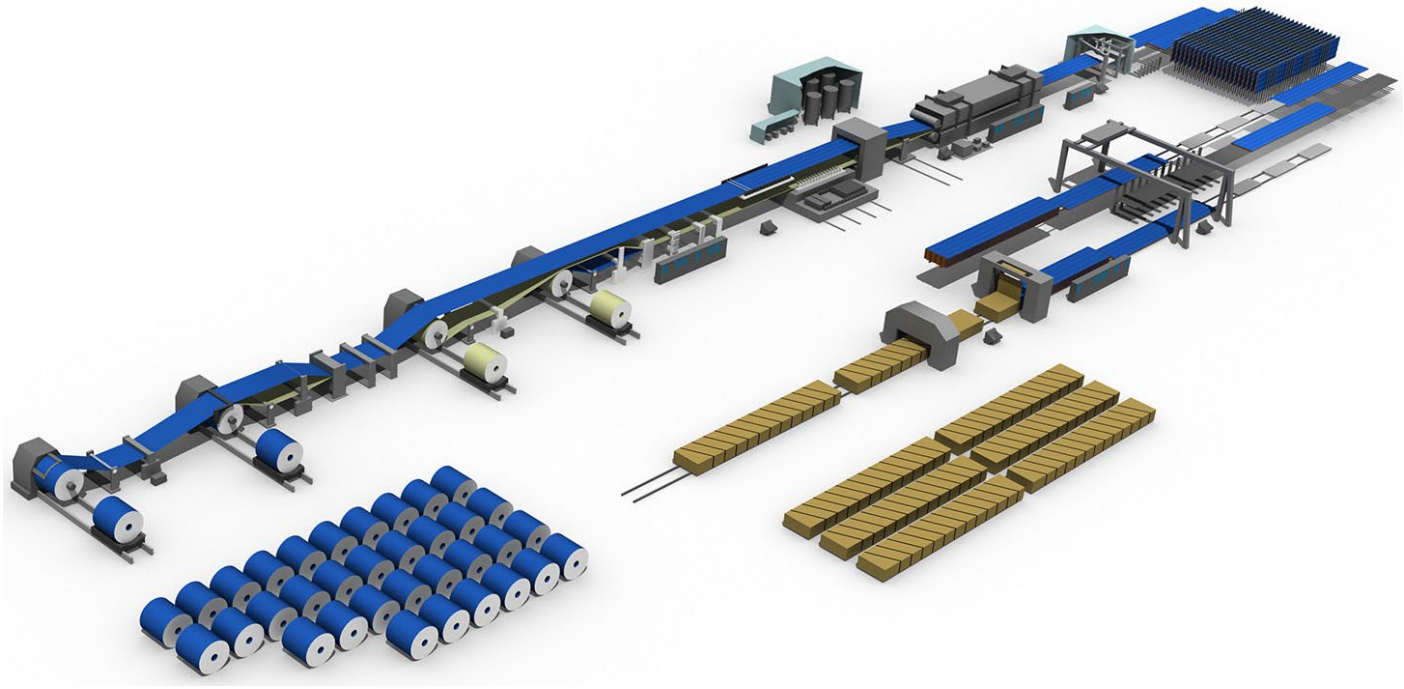
Embossing (Off-line) Process	
Process Step	**Description**
1	Decoiler
2	Embossing
3	Recoiler

Discontinuous Production Line (DPL) for Foam Panels	
Process Step	**Description**
1	Decoiling of Facings
2	Slitting
3	Rollforming
4	Foam Injection
5	Lamination
6	Saw (Panel Cut to Length)
7	Panel Cooling
8	Bundle Packaging

DPL Unit Process Descriptions	
Metal Fabrication	Metal facings are embossed, trimmed, and rollformed into desired shape.
Foam Injection and Curing	Chemicals are metered and dispensed between two facings into foam and allowed to cure.
Panel Fabrication and Packaging	Panels are cut to size and placed into bundles for delivery

Metl-Span
Insulated Metal Wall and Roof Panels
CF42 & CFR42

According to ISO 14025, EN 15804 and ISO 21930:2017



Metl-Span insulated panels are produced by injecting Class I liquid urethane foam between sheets of coated metal. The foam undergoes a chemical reaction which causes it to expand inside the cavity between the sheets, completely filling the space and bonding the foam to the metal surfaces. The result is a single, integrated unit that offers consistent thermal values, functions as the air/water/vapor barrier, and does not contribute to insect/rodent infestation. This process allows the production of insulating panels in a wide range of sizes, styles, colors and coatings to suit different applications.

The life cycle assessment conducted for this EPD accounts for blowing agent emissions to atmosphere during manufacturing. Scrap panels from manufacturing are separated into metal and foam. Eighty-five percent of post-consumer scrap steel is assumed to be recycled (based on Steel Recycling Institute 2010 recycling rates) and the remainder landfilled. Scrap foam is ground up, leading to the release of blowing agent trapped in the foam, and sent to landfill. Packaging waste from inbound raw material transport is not considered.

Insulated metal panels covered by this EPD are manufactured in one to five of Metl-Span's locations according to the table below. Panels are then shipped via flatbed truck to the installation site.

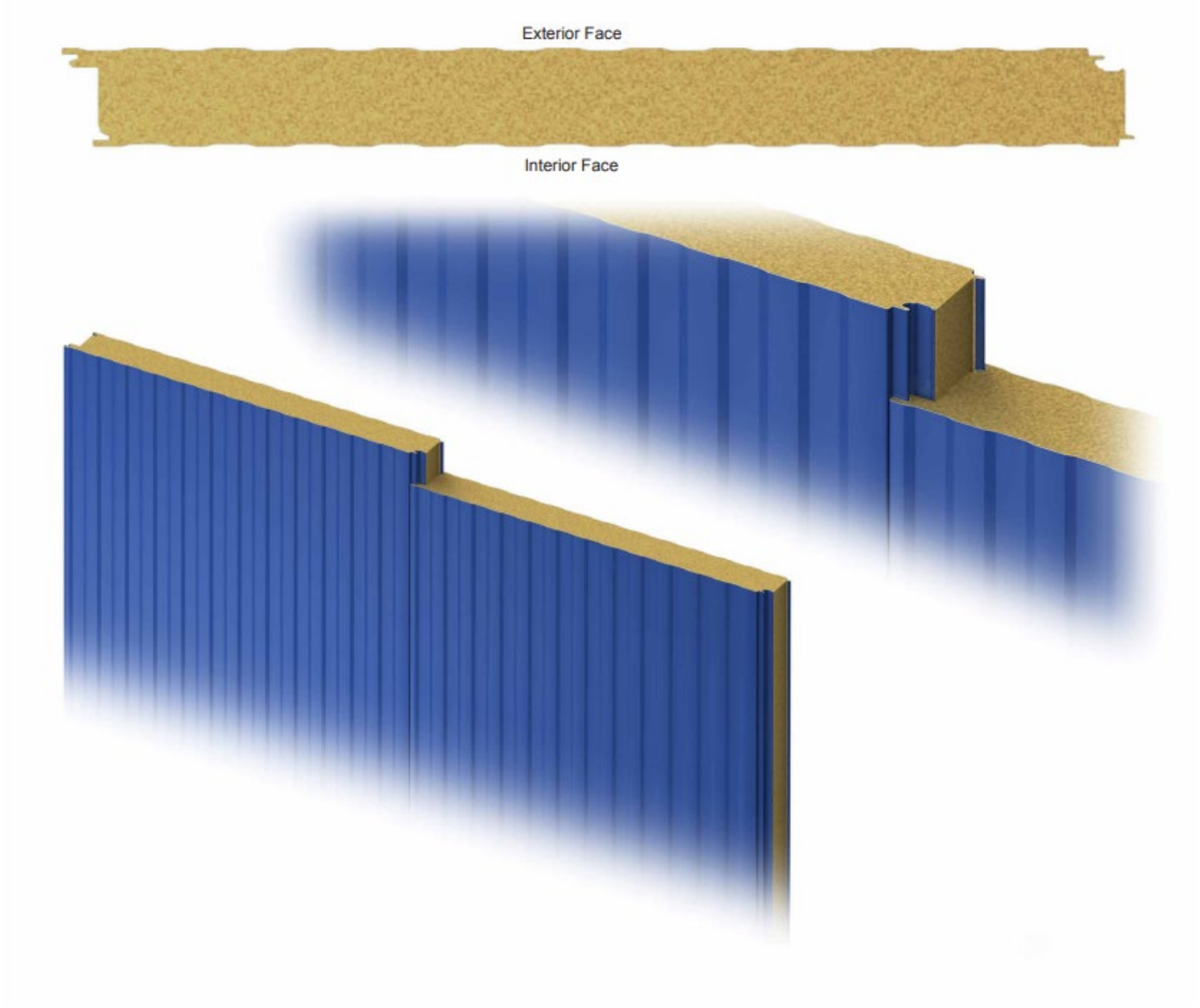
Table 2: Panel production locations

	CF42	CFR42
Texas	X	X
Virginia	X	X
Indiana	X	
Nevada	X	X
Ontario	X	

1.9. Packaging

Foam sheets are layered between insulated metal panels before the panels are stacked on (OSB) oriented strand board and (EPS) expanded polystyrene underlayment and wrapped in polyethylene film. Depending on the facility, chipboard may also be used in packaging. For the purposes of this LCA, packaging reuse is not modeled.

1.10. Product Installation



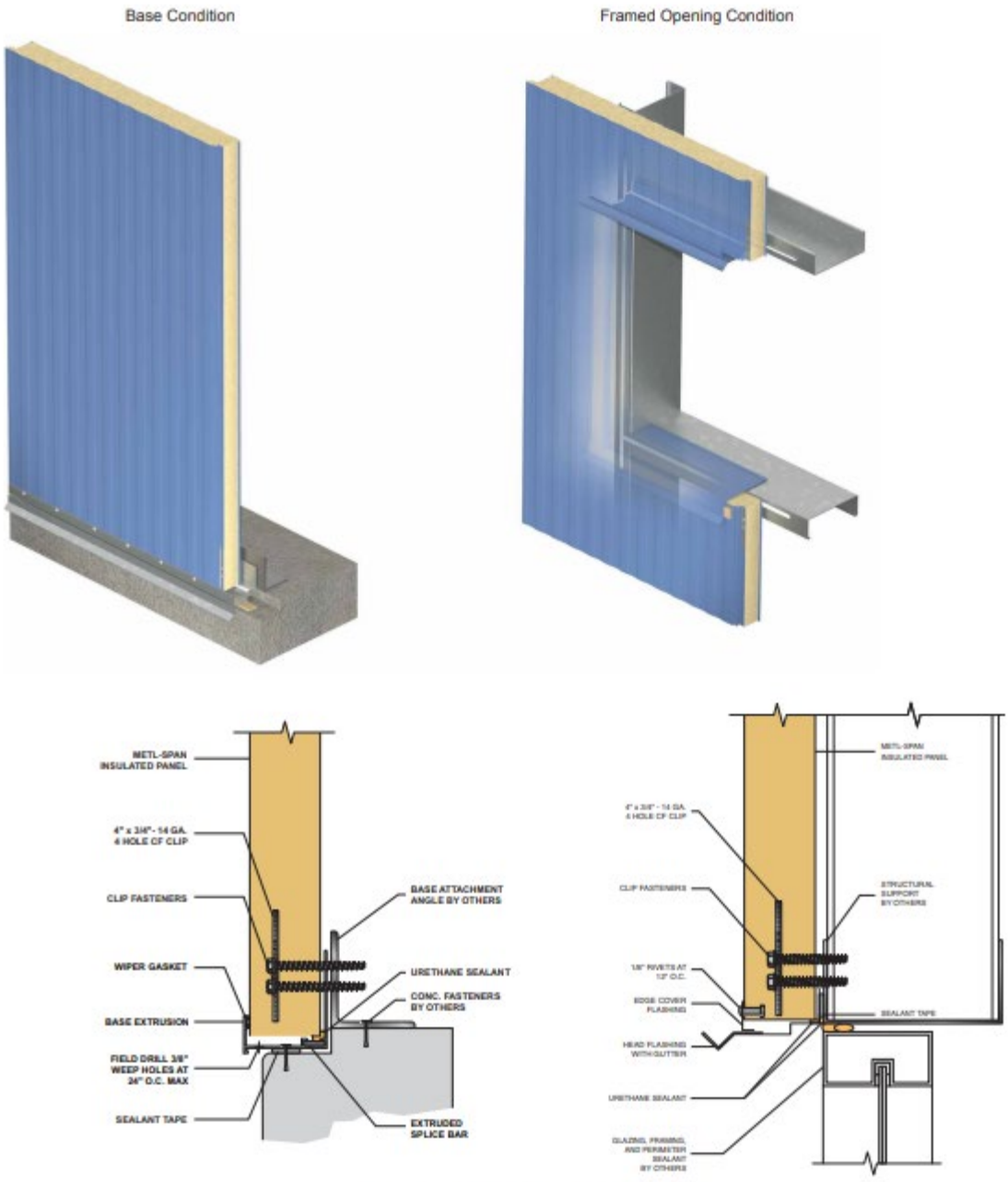
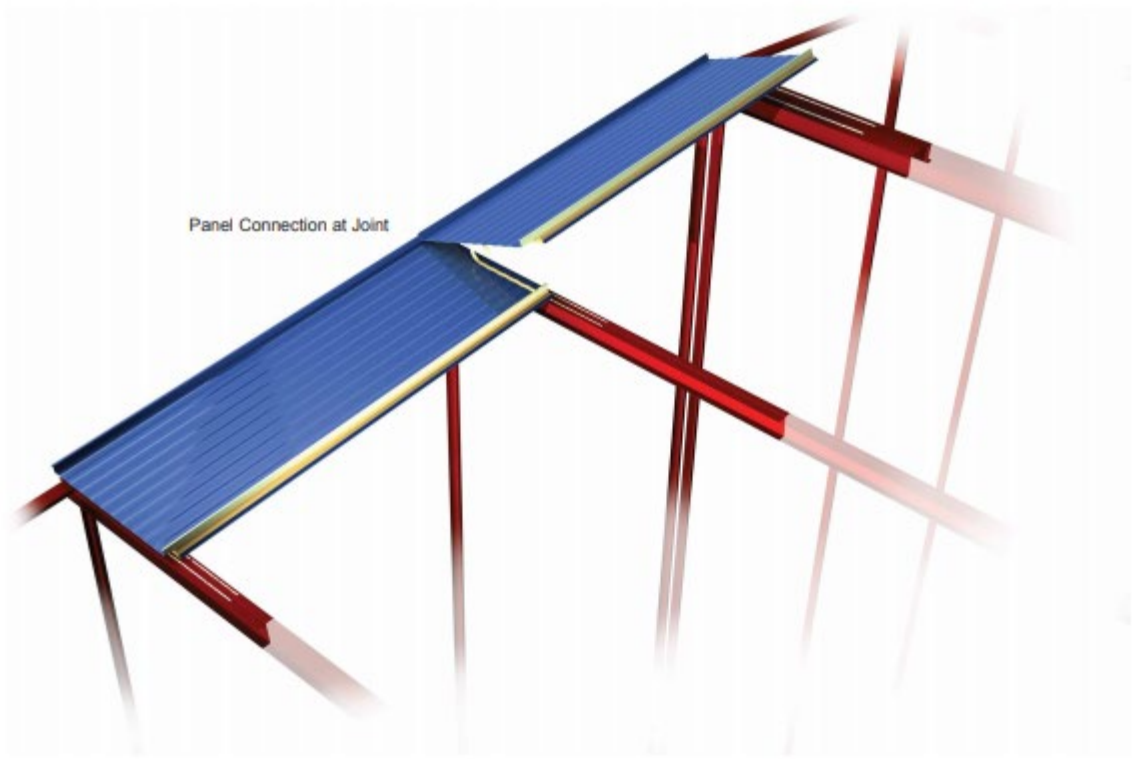


Figure 2: Example IMP Wall Installation Guidelines



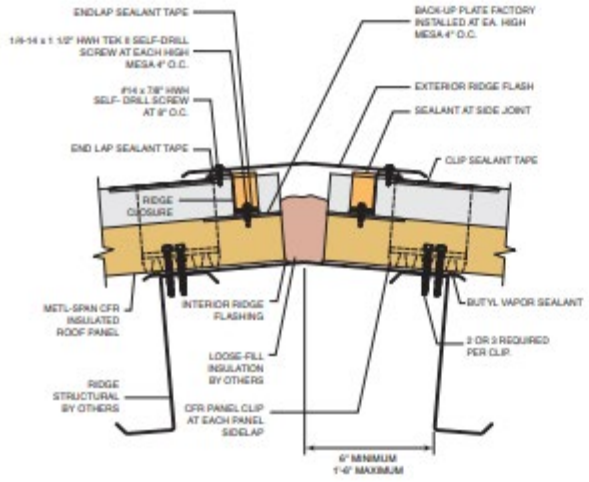


Figure 3: Example IMP Roof Installation Guide

2. Life Cycle Assessment Background Information

A full life cycle assessment has been carried out according to ISO 14040 (ISO, 2006), 14044 (ISO, 2006), and 21930 (ISO, 2017), per the product category rules (PCR) for insulated metal panels as published by UL Environment (UL, 2018).

The main purpose of EPDs is for use in business-to-business communication. As all EPDs are publicly available via the program operator and therefore are accessible to the end consumer, they can also be used in business-to-consumer communication.

2.1. Functional or Declared Unit

The declaration refers to the declared unit of coverage of 100 m² with metal product.

Table 3: Declared unit information

NAME	UNIT	CF42	CFR42
Declared unit	m^2	100	100
Mass	kg / DU	1.35E+03	1.33E+03

2.2. System Boundary

A “cradle-to-gate” life cycle analysis was conducted, from extraction of natural resources to final disposal. Within these boundaries the following stages were included:

– **Product Stage** (A1 – A3): Raw material supply, inbound transport of raw materials to manufacturing facility, manufacturing

Building use phase modules (B1 through B7) and end-of-life stage (C1-C4) were not assessed, nor were the construction and maintenance of capital equipment (e.g., production equipment). Additionally, human labor and employee commute were not included in the analysis.

2.3. Estimates and Assumptions

Metl-Span estimated blowing agent emission based on data collected from experiments that were conducted on an identical foam application system.

2.4. Cut-off Criteria

Data were included whenever possible. If it was necessary to exclude materials in order to facilitate the analysis, only flows representing less than 1% of the cumulative mass of the product system were excluded, providing their environmental relevance was judged not to be a concern.

Packaging of incoming raw materials (e.g., pallets, totes, super-sacks) are excluded as they represent less than 1% of

the product mass and are not expected to contribute significantly to the results per functional unit. Capital goods and infrastructure required to produce and install IMP products (e.g., batch mixers, installation equipment) are presumed to produce millions of units to over the course of their life, so impact of a single functional unit attributed to this equipment is negligible; therefore, capital goods and infrastructure were excluded from this study.

2.5. Data Sources

As a general rule, specific data derived from specific production processes or average data derived from specific production processes shall be the first choice as a basis for calculating LCA results.

For life cycle modeling of the considered products, the GaBi 10 Software system for life cycle engineering, developed by Sphera Solutions Inc., was used. All relevant background datasets were taken from the GaBi 2022 database. The datasets from the GaBi database are documented in the online documentation (Sphera, 2022).

The Worldsteel global average data were used for galvanized steel coil background data, with coil coating data obtained from the Metal Construction Association (MCA), of which Metl-Span is a member.

2.6. Data Quality

A variety of tests and checks were performed throughout the project to ensure high quality of the completed LCA. Checks included an extensive review of project-specific LCA models as well as the background data used.

Temporal Coverage

All of the primary data is taken from 12 months of continuous operation in the 2021 fiscal year. All secondary data were obtained from the GaBi 2022 databases and published EPDs. Data are representative of the years 2018 to 2021 (except for Oriented strand board and Softwood plywood, which are from 2005 and 2011 respectively).

Geographical Coverage

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. In the case of steel, worldsteel data (GLO: Steel hot dip galvanized), representative of global production is used. This is geographically appropriate, as the steel is sourced from outside of the US. Geographical representativeness is considered to be high.

Technological Coverage

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. Reference Period

Primary data collected from Metl-Span represent its operational activities in 2021. This analysis is intended to represent production in 2021.

2.8. Allocation

No multi-output (i.e., co-product) allocation was performed in the foreground system of this study.

Allocation of background data (energy and materials) taken from the GaBi 2022 database is documented online at https://sphera.com/wp-content/uploads/2020/04/Modeling-Principles-GaBi-Databases-2021.pdf.

End-of-Life allocation generally follows the requirements of ISO 14044, section 4.3.4.3 and the product category rule (UL Environment, 2018) . Under the PCR, the product life cycle is modeled using the cut-off approach. Scrap inputs to manufacturing are reported under the secondary materials metric.

Processing and recycling of the net amount of scrap leaving the system (i.e., scrap outputs minus secondary material inputs) is not included in this study.

2.9. Comparability

No comparisons or benchmarking is included in this EPD. LCA results across EPDs can be calculated with different background databases, modeling assumptions, geographic scope and time periods, all of which are valid and acceptable according to the Product Category Rules (PCR) and ISO standards. Caution should be used when attempting to compare EPD results.

3. Life Cycle Assessment Results

Cradle-to-gate life cycle impact assessment results are shown for both TRACI 2.0 and CML characterization factors. These results are relative expressions and do not predict impacts on category endpoints such as Human Health or Ecosystem Quality, the exceeding of thresholds, safety margins, or risks.

With respect to global warming potential, no credit was given for the sequestration of biogenic carbon during the growth of plants used in plant-derived packaging materials. Any carbon temporarily sequestered during the use of bio-based materials is assumed to be re-released to the atmosphere upon their decomposition. Since the lifetime of plant-derived packaging materials is shorter than the 100 year time horizon of this impact category (GWP 100), biogenic carbon was excluded from the global warming potential calculations.

Table 4. 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: Cradle-to-Gate	x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

3.1. Life Cycle Impact Assessment Results

Impact assessment and other results are shown for a cradle-to-gate, A1-3, for CF42 and CFR42.

Table 5. North American Impact Assessment Results, CF42 (R152A)

PARAMETER	UNIT	A1	A2	A3	TOTAL A1 - A3
GWP	[kg CO_2 eq.]	5.87E+03	1.87E+02	1.51E+02	6.21E+03
ODP	[kg CFC-11 eq.]	9.21E-05	3.47E-13	4.89E-12	9.21E-05
AP	[kg SO_2 eq.]	1.08E+01	1.57E+00	2.78E-01	1.26E+01
EP	[kg N eq.]	7.81E-01	8.33E-02	9.74E-03	8.74E-01
POCP	[kg O_3 eq.]	1.81E+02	3.15E+01	2.56E+00	2.15E+02
ADPF	Surplus MJ	9.81E+03	3.47E+02	1.47E+02	1.03E+04

Table 6. North American Impact Assessment Results, CF42 (R1234ze)

Parameter	Unit	A1	A2	A3	Total A1 - A3
GWP	[kg CO2 eq.]	6.07E+03	1.87E+02	4.28E+02	6.69E+03
ODP	[kg CFC-11 eq.]	9.21E-05	3.47E-13	4.89E-12	9.21E-05
AP	[kg SO2 eq.]	1.14E+01	1.57E+00	2.78E-01	1.32E+01
EP	[kg N eq.]	8.15E-01	8.33E-02	9.74E-03	9.08E-01
POCP	[kg O3 eq.]	1.87E+02	3.15E+01	2.09E+00	2.21E+02
ADPF	Surplus MJ	1.02E+04	3.47E+02	1.47E+02	1.07E+04

Table 7. North American Impact Assessment Results, CFR42 (R152A)

Parameter	Unit	A1	A2	A3	Total A1 - A3
GWP	[kg CO_2 eq.]	5.34E+03	1.42E+02	8.75E+01	5.57E+03
ODP	[kg CFC-11 eq.]	5.25E-05	2.65E-13	4.29E-12	5.25E-05
AP	[kg SO_2 eq.]	8.75E+00	1.21E+00	6.50E-02	1.00E+01
EP	[kg N eq.]	7.42E-01	6.73E-02	4.33E-03	8.14E-01
POCP	[kg O_3 eq.]	1.54E+02	2.47E+01	1.57E+00	1.80E+02
ADPF	Surplus MJ	1.08E+04	2.64E+02	8.92E+01	1.12E+04

Table 8. North American Impact Assessment Results, CFR42 (R1234ze)

Parameter	Unit	A1	A2	A3	Total A1 - A3
GWP	[kg CO_2 eq.]	5.56E+03	1.42E+02	4.20E+02	6.12E+03
ODP	[kg CFC-11 eq.]	5.25E-05	2.65E-13	4.29E-12	5.25E-05
AP	[kg SO_2 eq.]	9.41E+00	1.21E+00	6.50E-02	1.07E+01
EP	[kg N eq.]	7.81E-01	6.73E-02	4.33E-03	8.53E-01
POCP	[kg O_3 eq.]	1.61E+02	2.47E+01	1.01E+00	1.87E+02
ADPF	Surplus MJ	1.13E+04	2.64E+02	8.92E+01	1.17E+04

3.2. Life Cycle Inventory Results

Table 9. Resource Use, CF42 (R152A)

PARAMETER	UNIT	A1	A2	A3	TOTAL A1 - A3
RPR_E	[MJ]	4.95E+03	8.66E+01	2.43E+02	5.28E+03
RPR_M	[MJ, LHV]	-	-	-	-
$NRPR_E$	[MJ]	9.66E+04	2.62E+03	1.76E+03	1.01E+05
$NRPR_M$	[MJ, LHV]	-	-	-	-
SM	[kg]	7.65E+01	-	-	7.65E+01
RSF	[MJ, LHV]	-	-	-	-
NRSF	[MJ, LHV]	-	-	-	-
RE	[MJ, LHV]	-	-	-	-
FW	[m^3]	5.30E+02	3.07E-01	4.60E-01	5.31E+02

Table 10. Resource Use, CF42 (R1234ze)

PARAMETER	UNIT	A1	A2	A3	TOTAL A1 - A3
RPR_E	[MJ]	5.83E+03	8.66E+01	2.43E+02	6.16E+03
RPR_M	[MJ, LHV]	-	-	-	-
$NRPR_E$	[MJ]	1.00E+05	2.62E+03	1.76E+03	1.04E+05
$NRPR_M$	[MJ, LHV]	-	-	-	-
SM	[kg]	7.65E+01	-	-	7.65E+01
RSF	[MJ, LHV]	-	-	-	-
NRSF	[MJ, LHV]	-	-	-	-
RE	[MJ, LHV]	-	-	-	-
FW	[m^3]	5.31E+02	3.07E-01	4.60E-01	5.32E+02

Table 11. Resource Use, CFR42 (R152A)

PARAMETER	UNIT	A1	A2	A3	TOTAL A1 - A3
RPR_E	[MJ]	4.43E+03	6.71E+01	1.25E+02	4.62E+03
RPR_M	[MJ, LHV]	-	-	-	-
$NRPR_E$	[MJ]	9.60E+04	1.99E+03	9.36E+02	9.89E+04
$NRPR_M$	[MJ, LHV]	-	-	-	-
SM	[kg]	4.37E+01	-	-	4.37E+01
RSF	[MJ, LHV]	-	-	-	-
NRSF	[MJ, LHV]	-	-	-	-
RE	[MJ, LHV]	-	-	-	-
FW	[m^3]	3.13E+02	2.38E-01	1.72E-01	3.13E+02

Table 12. Resource Use, CFR42 (R1234ze)

PARAMETER	UNIT	A1	A2	A3	TOTAL A1 - A3
RPR_E	[MJ]	5.43E+03	6.71E+01	1.25E+02	5.62E+03
RPR_M	[MJ, LHV]	-	-	-	-
$NRPR_E$	[MJ]	9.99E+04	1.99E+03	9.36E+02	1.03E+05
$NRPR_M$	[MJ, LHV]	-	-	-	-
SM	[kg]	4.37E+01	-	-	4.37E+01
RSF	[MJ, LHV]	-	-	-	-
NRSF	[MJ, LHV]	-	-	-	-
RE	[MJ, LHV]	-	-	-	-
FW	[m^3]	3.14E+02	2.38E-01	1.72E-01	3.14E+02

Table 13. Output Flows and Waste Categories, CF42 (R152A)

Parameter	Unit	A1	A2	A3	Total A1 - A3
HWD	[kg]	1.93E-05	1.07E-08	7.73E-08	1.94E-05
NHWD	[kg]	1.18E+02	2.05E-01	4.45E+00	1.22E+02
HLRW	[kg]	1.48E-03	8.48E-06	1.75E-04	1.67E-03
ILLRW	[kg]	1.19E+00	7.14E-03	1.46E-01	1.34E+00
CRU	[kg]	-	-	-	-
MR	[kg]	-	-	-	-
MER	[kg]	-	-	-	-
EE	[MJ, LHV]	-	-	-	-

Table 14. Output Flows and Waste Categories, CF42 (R1234ze)

Parameter	Unit	A1	A2	A3	Total A1 - A3
HWD	[kg]	1.98E-05	1.07E-08	7.73E-08	1.99E-05
NHWD	[kg]	1.20E+02	2.05E-01	4.45E+00	1.25E+02
HLRW	[kg]	1.59E-03	8.48E-06	1.75E-04	1.77E-03
ILLRW	[kg]	1.29E+00	7.14E-03	1.46E-01	1.44E+00
CRU	[kg]	-	-	-	-
MR	[kg]	-	-	-	-
MER	[kg]	-	-	-	-
EE	[MJ, LHV]	-	-	-	-

Table 15. Output Flows and Waste Categories, CFR42 (R152A)

PARAMETER	UNIT	A1	A2	A3	TOTAL A1 - A3
HWD	[kg]	1.32E-05	8.14E-09	4.96E-08	1.32E-05
NHWD	[kg]	9.26E+01	1.58E-01	2.28E+00	9.50E+01
HLRW	[kg]	1.65E-03	6.47E-06	8.47E-05	1.74E-03
ILLRW	[kg]	1.36E+00	5.45E-03	7.08E-02	1.44E+00
CRU	[kg]	-	-	-	-
MR	[kg]	-	-	-	-
MER	[kg]	-	-	-	-
EE	[MJ, LHV]	-	-	-	-

Table 16. Output Flows and Waste Categories, CFR42 (R1234ze)

PARAMETER	UNIT	A1	A2	A3	TOTAL A1 - A3
HWD	[kg]	1.37E-05	8.14E-09	4.96E-08	1.38E-05
NHWD	[kg]	9.52E+01	1.58E-01	2.28E+00	9.76E+01
HLRW	[kg]	1.78E-03	6.47E-06	8.47E-05	1.87E-03
ILLRW	[kg]	1.47E+00	5.45E-03	7.08E-02	1.55E+00
CRU	[kg]	-	-	-	-
MR	[kg]	-	-	-	-
MER	[kg]	-	-	-	-
EE	[MJ, LHV]	-	-	-	-

Biogenic carbon is not reported in GWP as insulated metal panels do not typically contain bio-based materials. As such, carbon emissions and removals are not declared.

4. LCA Interpretation

Raw materials (A1) are the primary contributor to global warming potential (GWP) in the production of insulated metal panels as A1 accounts for 91% to 96% of the total GWP emission. The impact of A1 dominates across all other impact categories —specifically, due to the production of steel, MDI, and polyester polyol. Manufacturing (A3) contributes around 6% to 7% for the panel with R1234ze blowing agent and around 2% for the panel with R152A blowing agent.

Though some raw materials are transported vast distances, the inbound transportation module (A2) has a modest contribution to overall impact.

5. Additional Environmental Information

5.1. Mandatory Environmental Information

No substances required to be reported as hazardous—as defined by the Resource Conservation and Recovery Act—are associated with the production of Metl-Span's insulated metal panels.

5.2. Environment and Health during Installation

Metl-Span complies with all federal, state and local health and safety requirements. Our employee safety policies, practices and systems meet or exceed OSHA standards.

6. References

Avery, N., & Coleman, N. (2009). Life Cycle Assessment Methohdologies for Quantifying the Benefites of Steel Reuse and Recycling. *Construction Information Quarterly*, 127-131.

European Standards. (2013). *EN 15804+A1 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.*

ISO. (2006). ISO 14040: Environmental management - Life cycle assessment - Requirements and guidelines. Amd 1:2017/Amd 2:2020.

ISO. (2006). ISO 14044: Environmental management - Life cycle assessment - Requirements and guidelines. Amd 1:2017/Amd 2:2020.

ISO. (2011). ISO 14025: Environmental labels and declarations - Type III environmental declarations - principles and procedures.

ISO. (2017). *ISO 21930 Sustainability in building construction - Environmental declaration of building products.*

Kjeldsen, P., & Jensen, M. (2001). Release of CFC-11 from Disposal of Polyurethane Foam Waste. *ENVIRONMENTAL SCIENCE & TECHNOLOGY*, 3055-3063.

Kjeldsen, P., & Jensen, M. H. (2001). Release of CFC-11 from Disposal of Polyurethane Foam Waste. *ENVIRONMENTAL SCIENCE & TECHNOLOGY*, 3055-3063.

Mathis, P. (2011). Lifecycle Analysis of High-Global Warming Potential Greenhouse Gas Destruction. *California Air Resource Board*.

Scheutz, C., Frendenslund, A., & Kjeldsen, P. (2003). Attenuation of Alternative Blowing Agents in Landfills. *Californrnia Air Resource Board*.

Sphera. (2022). *GaBi LCA Database Documentation*. Retrieved from http://database-documentation.gabi-software.com

thinkstep. (2018). GaBi ts: Software system and database for life cycle engineering. Stuttgart, Echterdingen, Germany.

UL. (2018). *Product Category Rule Guidance for Building-Related Products and Services, Part B: Flooring EPD Requirements.*

UL. (2018). *Product Category Rules for Building-Related Products and Services in North America - Part A: Life Cycle Assessment Calculation Rules and Report Requirements.*

UL Environment. (2018). *Product Category Rules for Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: UL 10010-5.* UL Environment.

7. Contact Information

7.1. Study Commissioner

Metl-Span
1720 Lakepointe Drive, Suite #101
Lewisville, TX 75057
972.221.6656
info@metlspan.com
www.metlspan.com

7.2. LCA Practitioner

Sphera Solutions, Inc.
130 E. Randolph St., Suite 2900,
Chicago, IL 60601
servicequality@Sphera.com
https://sphera.com/