



Declaration Owner

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Product

KingSeam®, KingRib® 3, and KingRib® 5 produced in Little Rock, AR

Functional Unit

The functional unit is 100 m^2 of building coverage area over a 75-year building service life.

EPD Number and Period of Validity

SCS-EPD-10646
EPD Valid December 23, 2025 through December 22, 2030

Product Category Rule

PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 4.0. UL Environment. Mar. 2022

PCR 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. October 23, 2018.

Program Operator

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Declaration Owner:	Kingspan Group
Address:	726 Summerhill Drive, DeLand, Florida 32724
Declaration Number:	SCS-EPD-10646
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Program Operator:	SCS Global Services
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LCA Practitioner:	Vicki Rybl, Sagar Siripuram | WAP Sustainability
LCA Software and LCI database:	LCA FE - Version 10.9, MLC 2022.1
Product RSL:	30 years
Markets of Applicability:	North America
EPD Type:	Product Specific, Facility Specific
EPD Scope:	Cradle-to-Grave
LCIA Method and Version:	TRACI 2.1, CML 2001-Aug 2016, IPCC AR6
Independent critical review of the LCA and data, according to ISO 14044, ISO 21930 and ISO 14071	☐ INTERNAL ☒ EXTERNAL
LCA Reviewer:	Connor Mikre Connor Mikre
Part A Product Category Rule:	PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 4.0, UL Environment. 2022.
Part A PCR Review conducted by:	Lindita Bushi, PhD (Chair); Hugues Imbeault-Tétreault, ing., M.Sc.A.; Jack Geibig
Part B Product Category Rule:	PCR Guidance for Building-Related Products and Services Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels, UL 10010–5. October 23, 2018
Part B PCR Review conducted by:	Thomas Gloria (Chair), Industrial Ecology Consultants; Lindita Bushi, PhD; Bob Zebcik, PE
Independent verification of the declaration and data, according to ISO 14025, ISO 21930 and the PCR	☐ INTERNAL ☒ EXTERNAL
EPD Verifier:	Connor Mikre Connor Mikre

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled. In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.*

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1. About Kingspan Group

Kingspan offers aesthetic flexibility with a vast range of insulated panel profiles supported by state-of-the-art specialty fabrications. Their commercial insulated metal roof and wall panel systems combine design flexibility, efficiency, and performance to create the ultimate building envelope solution. Their wide range of insulated metal wall panel systems meets the needs of a variety of market sectors. Their wall systems offer superior quality and high R-values, while providing a modern look.

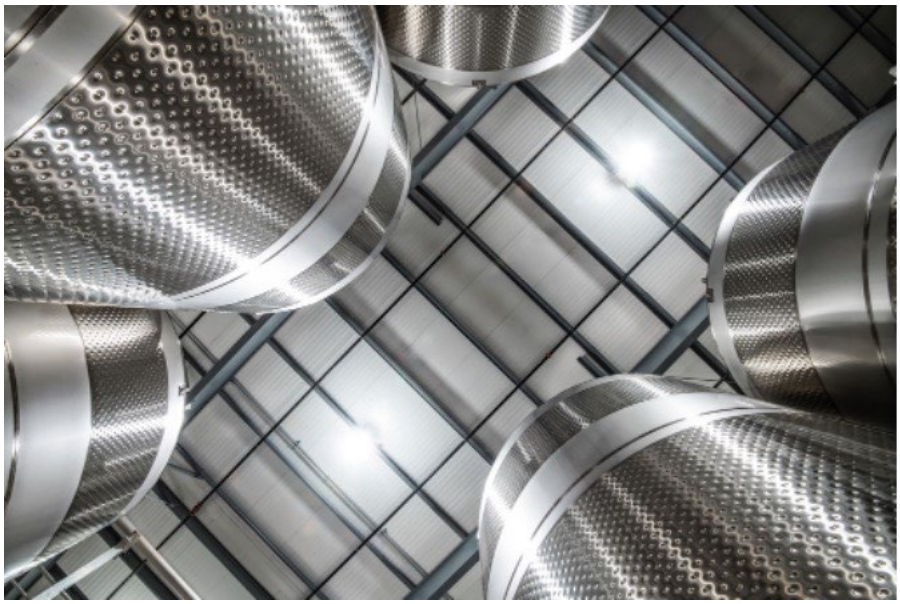
2. Product

2.1 Product Description

Insulated metal panels are comprised of a rigid foam core sandwiched between two metal sheets and cut to shape and size as requested by the customer. Interior and exterior insulated metal panels offer an efficient alternative to field assembled roofing systems. In the factory, steel substrates and insulating foam are combined to create lightweight, strong and energy efficient panels. A variety of solutions are available to meet the requirements of almost any building. They are also available in numerous colors and applied finishes.

This EPD covers KingSeam®, KingRib® 3, and KingRib® 5.

This EPD covers insulated metal panels products produced in Little Rock, AR using polyisocyanurate (PIR) foam and steel coil. The supply in the raw materials stage (A1) represents the supplier average sourcing of steel coil.



2.2 Application

KingSeam® and KingRib® are used in a variety of applications including architectural, commercial, industrial, institutional, and cold storage applications due to the excellent thermal efficiency, ease of installation and overall structural integrity.

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2.3 Technical Data

The following technical data is relevant for the declared as-delivered product. Additional performance test results are also disclosed, as applicable. All products have been extensively tested under a variety of North American standards.

Table 1: Technical Data

Property	Test Results	Units
Length	2.44 – 15.2	m
Width	1.02	m
Thickness	50.8-152	mm
Density	32-40	kg/m^3
Tensile Strength (Adhesion)	0.057	MPa
Modulus of Elasticity (Steel)	200,000	MPa
U-value of assembly including interruptions to insulation	0.40-0.10	[W/m2*K] (@ 24 degC mean)
R value of typical materials where continuous	2.47-10.03	[m2*K/W] (@ 24 degC mean)
Water vapor permeance	This term/calculation is not relevant to IMPs as steel is not permeable.	Metric perms
Airborne sound reduction	Panels typically not used for sound reduction	dB
Sound absorption coefficient	Panels typically not used for sound reduction	%

2.4 Delivery Status

Kingspan supplies Insulated metal panels in a variety of sizes and configurations customized to customer requirements. Panel configurations have a range as follows:

- Thickness: from 2 inches to 6 inches
- Width: 40 inches
- Length: from 8 feet to 50 feet, depending on product

Joint configurations: The panel's overlapping joint is self-aligning and allows for easy sealant application at the panel joinery.

Facings: Material: Galvanized/Galvalume steel
Gauge ranges: 22, 24- and 26-gauge steel

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2.5 Material Composition

Table 2: Material Composition

Material	Amount - 2" thick panel, 26 / 26 ga (kg/ 100 m²)	Percentage of Total Mass	Amount - 6" thick panel, 22 / 22 ga (kg/ 100 m²)	Percentage of Total Mass
Insulated Metal Panel				
Steel	879	81%	1,372	70%
Foam	205	19%	576	30%
Coating	3.38	<1%	3.38	<1%
Total	**1,087**	**100%**	**1,951**	**100%**
Packaging				
Oriented strand board	33.0	90.5%	33.0	90.5%
Polystyrene	3.5	9.5%	3.5	9.5%
Plastic film	0.007	<1%	0.007	<1%
Total Packaging	**36.5**	**100%**	**36.5**	**100%**

Note: Products under study do not contain any regulated hazardous substances or dangerous substances per definitions of the same in North America.

2.6 Manufacturing

The manufacturing process begins with the mining/ processing of raw materials, which is a mixture composed mostly of steel, foam and some coating. In the continuous process method of producing insulated metal panels (see Figure 1), metal facers (here referred to as external and internal steel sheets) are continuously formed. Simultaneously, at another point on the continuous line, the foam mixture is injected into the panel assembly. The foam then expands and fills the cavity between the metal skins as they enter a platen conveyor. The panels are trimmed and embossed, after which the top and bottom edge details are profiled. Following this, they undergo a curing process and are cut to standard or customized lengths. Once cured, the panels are cooled, stacked, and packaged for shipping.

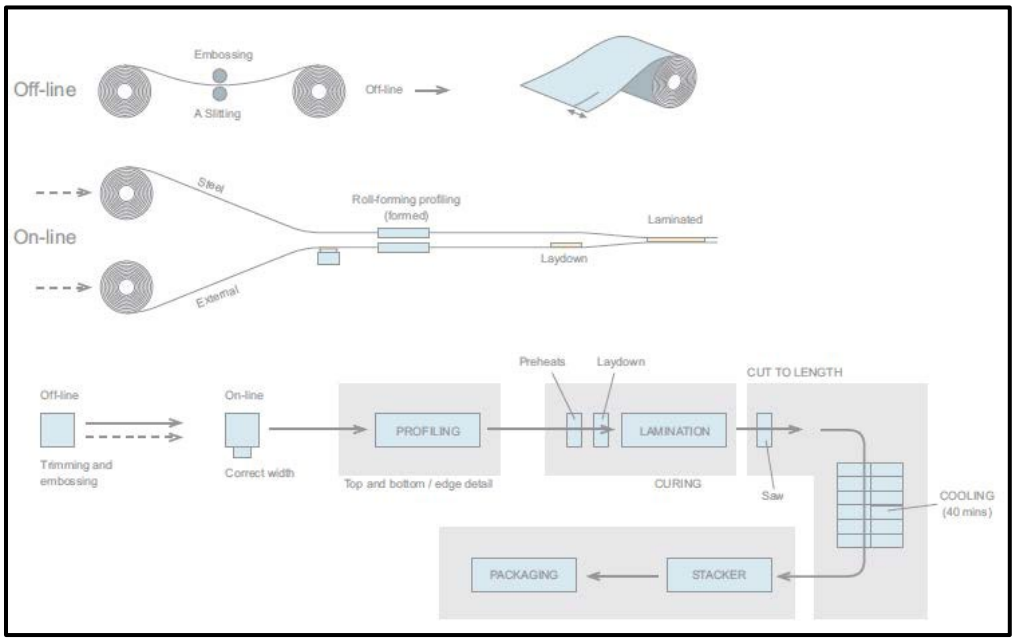


Figure 1: Schematic of continuous manufacturing process for insulated metal panels

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2.7 Transportation

The product is delivered to the customer via truck depending on the location of the end-user. Transport to the installation site was calculated based on sales records per product and an average shipping distance based on manufacturing location, as provided by the manufacturer.

2.8 Product Installation

The installation instructions require the use of white butyl caulk and some steel trim, clips and fasteners for recommended installation. From the installation instructions, it is understood that there is a forklift and panel cutting equipment that is used during installation as well. However, due to limited data availability on the amount of resources (here, electricity and diesel) used for these operations, quantities recommended by the PCR (Part B) have been used.

2.9 Packaging

Once the panels are manufactured, foam sheets are layered between insulated metal panels before the panels are bundled and stacked on wooden pallets. The pallets are then buffered with foam and wrapped in plastic film to prevent damage during transportation.

2.10 Use Conditions

The panels are cleaned once a year for roof applications with 500 ml of 1% (v/v) sodium lauryl sulfate solution. Cleaning frequency and material amount recommendations are taken from Part B of the PCR. More information is provided in the table below.

Table 3: Items Included in Life Cycle Stages B1-B7

Included	Excluded
Energy, materials, and water related to the usage of the product, including product operation, cleaning, and maintenance.	Production of multi-use cleaning, repair, installation, and maintenance tools
Energy, materials, and water related to the upkeep of the product, including product repair, refurbishment, and replacement.	
Production, transport, and waste processing and disposal of the new product after replacement to meet the required functional unit	

2.11 Reference Service Life

The Reference Service Life (RSL) of the Insulated Metal Panels is taken to be 30 years. Therefore, 1.5 replacements after the first installation are needed over the estimate service life of a building (75 years). More information is provided in Table 6: Reference Service Life.

2.12 Re-Use Phase

Insulated panels are typically not re-used after their service life.

2.13 Disposal

All waste has been classified and modeled according to regional-specific legislation as required in Section 2.8.6 in Part A: Life Cycle Assessment Calculation rules and Report Requirements from UL Environment.

Kingspan has designed their insulated metal panels for disassembly and the metal panel can be separated from the insulation core. After separation, the metal panels can be recycled through locally available metal recycling facilities and the insulation core can be reused as stand-alone insulation.

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3. LCA: Calculation Rules

3.1 Functional Unit

The functional unit used in the study, as specified in the PCR, is coverage of 100 m^2 of panel surface over 75 years. The reference flow of the product system, which is the mass of 100 m^2 of insulated metal panel is 1,087 kg for the lightest configuration (2" thick panel, 26 / 26 ga) and 1,951 kg for the heaviest configuration (6" thick panel, 22 / 22 ga).

3.2 System Boundary

The scope of the EPD is cradle-to-grave, including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. Per ISO 21930, the system boundary for the LCA follows the modularity principle and the polluter pays principle.

Product			Construction		Use							End-of-life				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 extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

MND = Module Not Declared

3.3 Units

All results are presented using SI units using three significant figures, as per PCR guidance.

3.4 Estimates and Assumptions

All estimates and assumptions are within the requirements of ISO 14040/44. The majority of the estimations are within the primary data. The primary data was collected as annual totals including all utility usage and production information. For the study, the usage information was divided by the production to create an energy and water use per square meter, then extrapolated to 100 square meters. Another assumption is that the installation tools are used enough times that the per square meter impacts are negligible.

It should also be noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The PCR allows for the results for several inventory flows related to construction products to be reported as "other parameters". These are aggregated inventory flows and do not characterize any potential impact; results should be interpreted taking into account this limitation.

3.5 Cut-off criteria

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit. No known flows are deliberately excluded from this LCA.

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3.6 Data Sources

Primary data were provided by the manufacturer for the product bill of materials and manufacturing at their Little Rock, AR facility, as well as from their suppliers of steel coil for the metal panel products. The sources of secondary LCI data are Sphera Managed LCA Content (MLC) version 2022.1.

3.7 Data Quality

Data were collected from the manufacturer and any inconsistencies were resolved through email and telephone communication with technical associates at the manufacturer. Throughout the data collection process, data was validated through mass balance checks, benchmarking between products and manufacturing facilities, and benchmarking against previous LCA results to ensure that the data provided were accurate and complete.

The geographic scope of the manufacturing portion of the life cycle is the United States. All primary data were collected from the manufacturer. The geographic coverage of primary data is considered excellent.

The primary data provided by the manufacturer represents all information for 2024. Using this data meets the PCR requirements. Time coverage of this data is considered excellent. Primary data provided by the manufacturer are specific to the technology that Kingspan uses to manufacture their product. They are site-specific and considered of excellent quality.

Supplier EPDs were utilized for representing upstream steel coil production. This data represents the technology specific to the suppliers and technological representativeness of this data is considered excellent. Geographic coverage of this data is considered excellent. Time coverage of EPDs ranges from 2019 to 2021 and is considered of very good quality. All majority of steel supplier EPDs reported product- and site-specific results for LCIA impact categories. Supplier EPDs used consistent PCRs and LCIA methodologies for global warming potential and other LCA impact categories. However, the LCA modeling software and databases used were not consistent across supplier EPDs. Use of consistent LCA software and background LCA data would improve the consistency of this LCA.

It is worth noting that the electricity and thermal energy used in manufacturing the product includes overhead energy such as lighting and heating. Sub-metering would improve the technological coverage of data quality.

3.8 Period under review

This EPD is based on data for 2024.

3.9 Allocation

General principles of allocation were based on ISO 14040/44. There are no products other than insulated metal panels that are produced as part of the manufacturing processes studied in the LCA. Since there are no co-products, no allocation based on co-products is required. To derive a per unit value for manufacturing inputs such as electricity, natural gas and water, allocation based on total production in square meters (allocation by area) was adopted. Discussions with staff divulged this was a more representative way than via mass to allocate the manufacturing inputs based on the manufacturing processes used and the types of products created. As a default, secondary GaBi datasets use a physical mass basis for allocation. Impacts from transportation were allocated based on the mass of material and distance transported.

Throughout the study recycled materials were accounted for via the cut-off method. Under this method, impacts and benefits associated with the previous life of a raw material from recycled stock are excluded from the system boundary. Additionally, impacts and benefits associated with secondary functions of materials at end of life are also excluded (i.e. production into a third life or energy generation from the incineration plant). The study does include the impacts associated with reprocessing and preparation of recycled materials that are part of the bill of materials of the products under study.

In consideration of the wide range of configurations available based on foam thickness and combinations of internal and external steel facing gauges, results are presented for the lightest (2" thick panel, 26 / 26 ga) and heaviest weight (6" thick panel, 22 / 22 ga) configurations. In this way, the range of results covers the wide range of product configurations.

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3.10 Comparability

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled. Comparison of the environmental performance of insulated metal panels using EPD information shall be based on the product's use and impacts at the construction works level, and therefore EPDs may not be used for comparability purposes when not considering the construction works energy use phase as instructed under this PCR. Full conformance with the PCR for insulated metal panels allows EPD comparability only when all stages of a life cycle have been considered, when they comply with all referenced standards, use the same sub-category Part B PCR, and use equivalent scenarios with respect to construction works. However, variation and deviations are possible.

4. LCA: Scenarios and Additional Technical Information

4.1 Delivery and Installation stage (A4 - A5)

Table 4: Transport to building site (A4) – per 100 m²

Name	Insulated Metal Panel	Unit
Fuel type	Diesel	-
Liters of fuel	39	l/100km
Vehicle type	Truck - Heavy Heavy-duty Diesel Truck / 53,333 lb payload - 8b	-
Transport distance (Average)	1,040	km
Capacity utilization	78	%
Weight of products transported	950 - 1,846	kg/100 m²
Volume of products transported	5.08 - 15.24	m³/100 m²
Capacity utilization volume factor	1	-

Table 5: Reference Service Life

Name	Insulated metal roof deck panel	Unit
RSL	30	years
Declared product properties and finishes, etc.	See Technical Data	-
Design application	Installation per recommendation by manufacturer	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Accepted industry standard	-
Use conditions	Normal building operating conditions	-

Table 6: Installation into the building (A5) – per 100 m²

Name	Quantity	Unit
White butyl caulk	15.3	kg/100 m²
Steel trims and fasteners	3.57	kg/100 m²
Electricity	2	kWh/100 m²
Diesel	3.15	kg/100 m²
Installation scrap rate	5%	%

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Name	Quantity	Unit
Waste materials at the construction site before waste processing, generated by product installation	81.7 - 124	kg/100 m^2
Product loss per functional unit, to landfill	45.2 – 87.9	kg/100 m^2
Packaging waste, wood	33	kg/100 m^2
Packaging waste, plastic film, polystyrene, stretch wrap	3.48	kg/100 m^2
Biogenic carbon contained in packaging	52.5	kg CO_2
Direct emissions to ambient air, soil and water	0	kg
VOC emissions	N/A	µg/m^3

4.2 Use stage (B1)

There are no inputs needed to use the product.

4.3 Maintenance stage (B2)

Table 7: Maintenance per 100 m^2 (B2)

Name	Truck	Unit
Maintenance process information	Use phase parameters as recommended by the UL PCR Part B	
Cleaning	30, 75	Cycles/ RSL and Cycles/ ESL
Detergent	0.0025	kg/ 100 m^2/ cleaning cycle
Net freshwater consumption specified by water source and fate	0.25 tap water, evaporated	kg/ 100 m^2/ cleaning cycle
Further assumptions for scenario development	500 ml of 1% (v/v) sodium lauryl sulfate solution, once per year	

4.4 Repair/Refurbishment stage (B3, B4, B5)

Insulated metal panels typically do not require repair or refurbishment during the service life of the building. 1.5 replacements are required over the 75-year lifetime of the building.

Table 8: Repair (B3)

Name	Value	Units
Repair process information	n/a	-
Inspection process information	n/a	-
Repair cycle	n/a	Cycles / RSL
Repair cycle	n/a	Cycles / ESL
Net freshwater consumption	n/a	m^3
Ancillary materials	n/a	kg
Energy input	n/a	kWh
Waste materials from repair	n/a	kg
Direct emissions to ambient air, soil, and water	n/a	kg
Further assumptions for scenario development	n/a	-

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Table 9: Replacement (B4)

Name	Value	Units
Reference Service Life	30	Years
Replacement cycle	1.5	(ESL/RSL) – 1
Energy input – Electricity	2	kWh / replacement
Energy input – Diesel	3.15	kg / replacement
Net fresh water consumption	0	m^3
Ancillary materials - White butyl caulk	15.3	kg / replacement
Ancillary materials - Steel trims and fasteners	3.57	kg / replacement
Replacement of worn parts, specify parts/materials	0	kg
Direct emissions to ambient air, soil, and water	0	kg
Further assumptions for scenario development	n/a	-
Waste generated after each replacement	1178 - 2085	kg / replacement

Table 10: Refurbishment (B5)

Name	Value	Units
Refurbishment process description	n/a	-
Replacement cycle	n/a	Cycles / RSL
Replacement cycle	n/a	Cycles / ESL
Energy input	n/a	kWh
Net fresh water consumption	n/a	m^3
Material input for refurbishment	n/a	kg
Waste materials	n/a	kg
Direct emissions to ambient air, soil, and water	n/a	kg
Further assumptions for scenario development	n/a	-

4.5 Building operation stage (B6 – B7)

No operational energy or water use is required.

Table 11: Operational energy use (B6) and Operational water use

Name	Value	Units
Net fresh water consumption	n/a	m^3
Ancillary materials	n/a	kg
Energy input	n/a	kWh
Power output of equipment	n/a	kW
Characteristic performance	n/a	-

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Name	Value	Units
Direct emissions to ambient air, soil, and water	n/a	kg
Further assumptions for scenario development	n/a	-

4.6 Disposal stage (C1 - C4)

Table 12: Disposal per 100 m² (C1-C4)

Name		2" thick panel, 26 / 26 ga	6" thick panel, 22 / 22 ga	Unit
Diesel for deconstruction		1.00	1.00	gal
Electricity for deconstruction		2.00	2.00	kWh
Assumptions for scenario development		Product is landfilled at end of life		
Collection process	Collected separately	0	0	kg
	Collected with mixed construction waste	905	1,758	kg
Recovery	Reuse	0	0	kg
	Recycling	0	0	kg
	Landfill	905	1,758	kg
	Incineration	0	0	kg
	Incineration with energy recovery	0	0	kg
	Energy conversion efficiency rate	n/a	n/a	%
Disposal	Product or material for final deposition	905	1,758	kg
Biogenic carbon contained in final product		0	0	kg

Kingspan has designed their Insulated Metal Panels for disassembly and the metal panel can be separated from the insulation core. After separation, the metal panels can be recycled through locally available metal recycling facilities and the insulation core can be reused as stand-alone insulation.
However, all waste has been classified and modeled according to regional-specific legislation as required in Section 2.8.6 in Part A: Life Cycle Assessment Calculation rules and Report Requirements from UL Environment due to unavailability of data to support the fact that the disposal pathway is standard practice for insulated metal panels.

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5. LCA: Results

Results are reported in this section for North America using IPCC AR6 for global warming potential, TRACI 2.1 for acidification, eutrophication, ozone depletion, and smog formation potential, and CML 2001 – August 2016 for abiotic depletion of fossil resources. Global warming potential is reported excluding biogenic carbon, therefore per ISO 21930, indicators pertaining to the uptake and emissions of biogenic CO2 are not reported.

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

5.1 Results for 100 m^2 of 2'' thick insulated metal panels with 26 ga facings on both sides (lightest configuration)

Results for 2'' thick insulated metal panel with 26 ga facings on both sides (lightest product) over 75 years. All values are rounded to three significant digits. Results reported in MJ are calculated using lower heating value.

Impact Category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	kg CO_2 eq.	2.39E+03	7.39E+01	1.97E+02	0.00E+00	6.16E-03	0.00E+00	4.08E+03	0.00E+00	0.00E+00	0.00E+00	1.41E+01	4.56E+00	0.00E+00	3.89E+01	MND
AP	kg SO2 eq.	5.66E+00	3.67E-01	7.17E-01	0.00E+00	8.32E-06	0.00E+00	1.06E+01	0.00E+00	0.00E+00	0.00E+00	1.22E-01	2.29E-02	0.00E+00	1.69E-01	MND
EP	kg N eq.	3.95E-01	3.21E-02	9.49E-02	0.00E+00	7.25E-07	0.00E+00	8.14E-01	0.00E+00	0.00E+00	0.00E+00	9.35E-03	2.00E-03	0.00E+00	9.42E-03	MND
ODP	kg CFC-11 eq.	3.95E-07	1.39E-13	2.01E-08	0.00E+00	9.37E-17	0.00E+00	6.22E-07	0.00E+00	0.00E+00	0.00E+00	4.86E-14	8.70E-15	0.00E+00	1.25E-12	MND
SFP	kg O_3 eq.	9.12E+01	8.48E+00	1.12E+01	0.00E+00	1.97E-04	0.00E+00	1.78E+02	0.00E+00	0.00E+00	0.00E+00	4.26E+00	5.29E-01	0.00E+00	2.97E+00	MND
ADP_{fossil}	MJ	3.58E+04	1.03E+03	2.62E+03	0.00E+00	1.51E-01	0.00E+00	6.04E+04	0.00E+00	0.00E+00	0.00E+00	1.96E+02	6.43E+01	0.00E+00	5.79E+02	MND
Resource Use																
RPRE	MJ, LHV	2.70E+03	4.03E+01	1.67E+02	0.00E+00	4.15E-03	0.00E+00	4.47E+03	0.00E+00	0.00E+00	0.00E+00	8.51E+00	2.52E+00	0.00E+00	5.55E+01	MND
RPRM	MJ, LHV	5.94E+02	0.00E+00	2.97E+01	0.00E+00	0.00E+00	0.00E+00	9.35E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRPRE	MJ, LHV	3.75E+04	1.04E+03	2.72E+03	0.00E+00	1.56E-01	0.00E+00	6.32E+04	0.00E+00	0.00E+00	0.00E+00	1.98E+02	6.48E+01	0.00E+00	5.92E+02	MND
NRPRM	MJ, LHV	1.41E+02	0.00E+00	7.07E+00	0.00E+00	0.00E+00	0.00E+00	2.23E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW	m3	8.26E+02	1.45E-01	4.14E+01	0.00E+00	2.20E-04	0.00E+00	1.30E+03	0.00E+00	0.00E+00	0.00E+00	2.89E-02	9.06E-03	0.00E+00	8.50E-02	MND
Output Flows																
HWD	kg	2.15E-02	0.00E+00	1.07E-03	0.00E+00	0.00E+00	0.00E+00	3.39E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

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Impact Category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
NHWD	kg	3.26E+01	0.00E+00	8.38E+01	0.00E+00	0.00E+00	0.00E+00	1.56E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.24E+02	MND
HLRW	kg	6.73E-04	3.40E-06	4.06E-05	0.00E+00	2.12E-09	0.00E+00	1.09E-03	0.00E+00	0.00E+00	0.00E+00	1.16E-06	2.13E-07	0.00E+00	5.92E-06	MND
ILLRW	kg	6.77E-01	2.87E-03	3.96E-02	0.00E+00	1.77E-06	0.00E+00	1.09E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-04	1.79E-04	0.00E+00	5.19E-03	MND
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MR	kg	9.21E+01	0.00E+00	5.13E+00	0.00E+00	0.00E+00	0.00E+00	1.46E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EEE	MJ	2.38E+01	0.00E+00	1.19E+00	0.00E+00	0.00E+00	0.00E+00	3.75E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EET	MJ	9.59E+00	0.00E+00	4.80E-01	0.00E+00	0.00E+00	0.00E+00	1.51E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

MND = Module not declared

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5.2 Results for 100 m² of 6'' thick insulated metal panels with 22 ga facings on both sides (heaviest configuration)

Results for 6'' thick insulated metal panel with 22 ga facings on both sides (heaviest product) over 75 years. All values are rounded to three significant digits. Results reported in MJ are calculated using lower heating value.

Impact Category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP	kg CO_2 eq.	4.71E+03	1.41E+02	3.18E+02	0.00E+00	6.16E-03	0.00E+00	7.91E+03	0.00E+00	0.00E+00	0.00E+00	1.41E+01	8.78E+00	0.00E+00	7.49E+01	MND
AP	kg SO2 eq.	1.06E+01	7.00E-01	9.89E-01	0.00E+00	8.32E-06	0.00E+00	1.92E+01	0.00E+00	0.00E+00	0.00E+00	1.22E-01	4.41E-02	0.00E+00	3.25E-01	MND
EP	kg N eq.	8.07E-01	6.11E-02	1.17E-01	0.00E+00	7.25E-07	0.00E+00	1.52E+00	0.00E+00	0.00E+00	0.00E+00	9.35E-03	3.86E-03	0.00E+00	1.81E-02	MND
ODP	kg CFC-11 eq.	1.14E-06	2.65E-13	5.72E-08	0.00E+00	9.37E-17	0.00E+00	1.79E-06	0.00E+00	0.00E+00	0.00E+00	4.86E-14	1.67E-14	0.00E+00	2.39E-12	MND
SFP	kg O_3 eq.	1.75E+02	1.62E+01	1.60E+01	0.00E+00	1.97E-04	0.00E+00	3.28E+02	0.00E+00	0.00E+00	0.00E+00	4.26E+00	1.02E+00	0.00E+00	5.72E+00	MND
ADP_{fossil}	MJ	7.68E+04	1.96E+03	4.74E+03	0.00E+00	1.51E-01	0.00E+00	1.27E+05	0.00E+00	0.00E+00	0.00E+00	1.96E+02	1.24E+02	0.00E+00	1.11E+03	MND
Resource Use																
RPRE	MJ, LHV	5.97E+03	7.67E+01	3.35E+02	0.00E+00	4.15E-03	0.00E+00	9.75E+03	0.00E+00	0.00E+00	0.00E+00	8.51E+00	4.85E+00	0.00E+00	1.07E+02	MND
RPRM	MJ, LHV	5.94E+02	0.00E+00	2.97E+01	0.00E+00	0.00E+00	0.00E+00	9.35E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRPRE	MJ, LHV	8.05E+04	1.97E+03	4.94E+03	0.00E+00	1.56E-01	0.00E+00	1.33E+05	0.00E+00	0.00E+00	0.00E+00	1.98E+02	1.25E+02	0.00E+00	1.14E+03	MND
NRPRM	MJ, LHV	1.41E+02	0.00E+00	7.07E+00	0.00E+00	0.00E+00	0.00E+00	2.23E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW	m3	1.38E+03	2.76E-01	6.93E+01	0.00E+00	2.20E-04	0.00E+00	2.18E+03	0.00E+00	0.00E+00	0.00E+00	2.89E-02	1.74E-02	0.00E+00	1.63E-01	MND
Output Flows																
HWD	kg	2.15E-02	0.00E+00	1.07E-03	0.00E+00	0.00E+00	0.00E+00	3.39E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NHWD	kg	4.08E+01	0.00E+00	1.27E+02	0.00E+00	0.00E+00	0.00E+00	2.92E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E+03	MND
HLRW	kg	1.34E-03	6.48E-06	7.42E-05	0.00E+00	2.12E-09	0.00E+00	2.15E-03	0.00E+00	0.00E+00	0.00E+00	1.16E-06	4.09E-07	0.00E+00	1.14E-05	MND
ILLRW	kg	1.46E+00	5.46E-03	7.90E-02	0.00E+00	1.77E-06	0.00E+00	2.33E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-04	3.45E-04	0.00E+00	9.99E-03	MND
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MR	kg	1.52E+02	0.00E+00	8.10E+00	0.00E+00	0.00E+00	0.00E+00	2.40E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EEE	MJ	2.38E+01	0.00E+00	1.19E+00	0.00E+00	0.00E+00	0.00E+00	3.75E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EET	MJ	9.59E+00	0.00E+00	4.80E-01	0.00E+00	0.00E+00	0.00E+00	1.51E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

MND = Module not declared

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5.3 GWP Results for 100 m² of insulated metal panel for common product configurations

GWP results for common product configurations, based on foam thickness and interior/exterior steel gauge.

Foam Thickness (in.)	Int. Steel Gauge	Ext. Steel Gauge	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
2.5	26	26	2.55E+03	7.63E+01	2.05E+02	0.00E+00	6.16E-03	0.00E+00	4.34E+03	0.00E+00	0.00E+00	0.00E+00	1.41E+01	4.75E+00	0.00E+00	4.05E+01	MND
3	26	26	2.71E+03	8.01E+01	2.13E+02	0.00E+00	6.16E-03	0.00E+00	4.60E+03	0.00E+00	0.00E+00	0.00E+00	1.41E+01	4.99E+00	0.00E+00	4.25E+01	MND
3.25	26	26	2.79E+03	8.19E+01	2.18E+02	0.00E+00	6.16E-03	0.00E+00	4.73E+03	0.00E+00	0.00E+00	0.00E+00	1.41E+01	5.10E+00	0.00E+00	4.35E+01	MND
4	26	26	3.03E+03	8.76E+01	2.30E+02	0.00E+00	6.16E-03	0.00E+00	5.12E+03	0.00E+00	0.00E+00	0.00E+00	1.41E+01	5.45E+00	0.00E+00	4.65E+01	MND
5	26	26	3.35E+03	9.51E+01	2.46E+02	0.00E+00	6.16E-03	0.00E+00	5.64E+03	0.00E+00	0.00E+00	0.00E+00	1.41E+01	5.92E+00	0.00E+00	5.05E+01	MND
6	26	26	3.67E+03	1.03E+02	2.63E+02	0.00E+00	6.16E-03	0.00E+00	6.16E+03	0.00E+00	0.00E+00	0.00E+00	1.41E+01	6.39E+00	0.00E+00	5.45E+01	MND

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6. LCA: Interpretation

Overall, for Kingspan's KingSeam® and KingRib® products, GWP and Abiotic Depletion of fossil fuels are the impact categories of most significance. Within these impact categories, the majority of impacts are aggregated in the A1-A3 and B4 phases of the life cycle of the product. A1-A3 includes raw material sourcing, transportation, and manufacturing, and B4 includes the impacts associated with necessary replacements. The next largest life cycle stage is A5 in terms of GWP which is installation at customer's job site.

For insulated metal panels, in the raw material sourcing and manufacturing stages, the largest contributors to the impacts are the raw materials, mainly the steel sheet used in the product.

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7. Additional Environmental Information

7.1 Environment and Health during Manufacture

Kingspan has established Environmental, Health and Safety programs to ensure all federal, state, and local regulations are met or exceeded.

7.2 Environment and Health during Installation

Onsite personnel shall follow the appropriate safety protocols as determined by the relevant governing bodies. Kingspan recommends the use of suction lifters during installation, to maximize safety and minimize undue manual handling. All personnel performing installation tasks should wear proper clothing and protective equipment at all times. There are no harmful substances or emissions from the installation of this product.

7.3 Extraordinary Effects

Fire

Fire testing and approvals for all products included in the study are listed below. For further fire testing results, please visit the resource library for specific products here
https://www.kingspan.com/us/en/products/insulated-panel-systems/roof-panel-systems/

Test	Test Title	Results
FM 4880	Class 1 Fire Rating of Insulated Wall, Ceiling and Roof Panels	Passed: Class 1 Fire Rating of Building Panels or Interior Finish Material

Water

For water penetration testing results, please visit the resource library for specific products here
https://www.kingspan.com/us/en/products/insulated-panel-systems/roof-panel-systems/

Mechanical Destruction

If the product is mechanically destroyed, it should be disposed of using standard procedures and replaced promptly.

7.4 Environmental Activities and Certifications

At Kingspan, we are committed to operating a sustainable business that delivers sustainable products and solutions. With this in mind, we have pledged to continually advance and hone sustainable business practice across seven key areas:

- Energy and Carbon
- Waste and Water
- Supply Chain
- Product Innovation
- Product Lifecycle
- Employees
- Stakeholders and Community

Through Planet Passionate, we're playing our part by driving energy and carbon out of our business operations and supply chain, as well as increasing our recycling of rainwater and waste, while also accelerating our participation in the circular economy. To learn more please visit: https://www.kingspan.com/group/commitments/planet-passionate.

7.5 Further Information

For further information on the products detailed in this report, please visit:
https://www.kingspan.com/us/en/products/insulated-panel-systems/roof-panel-systems/

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