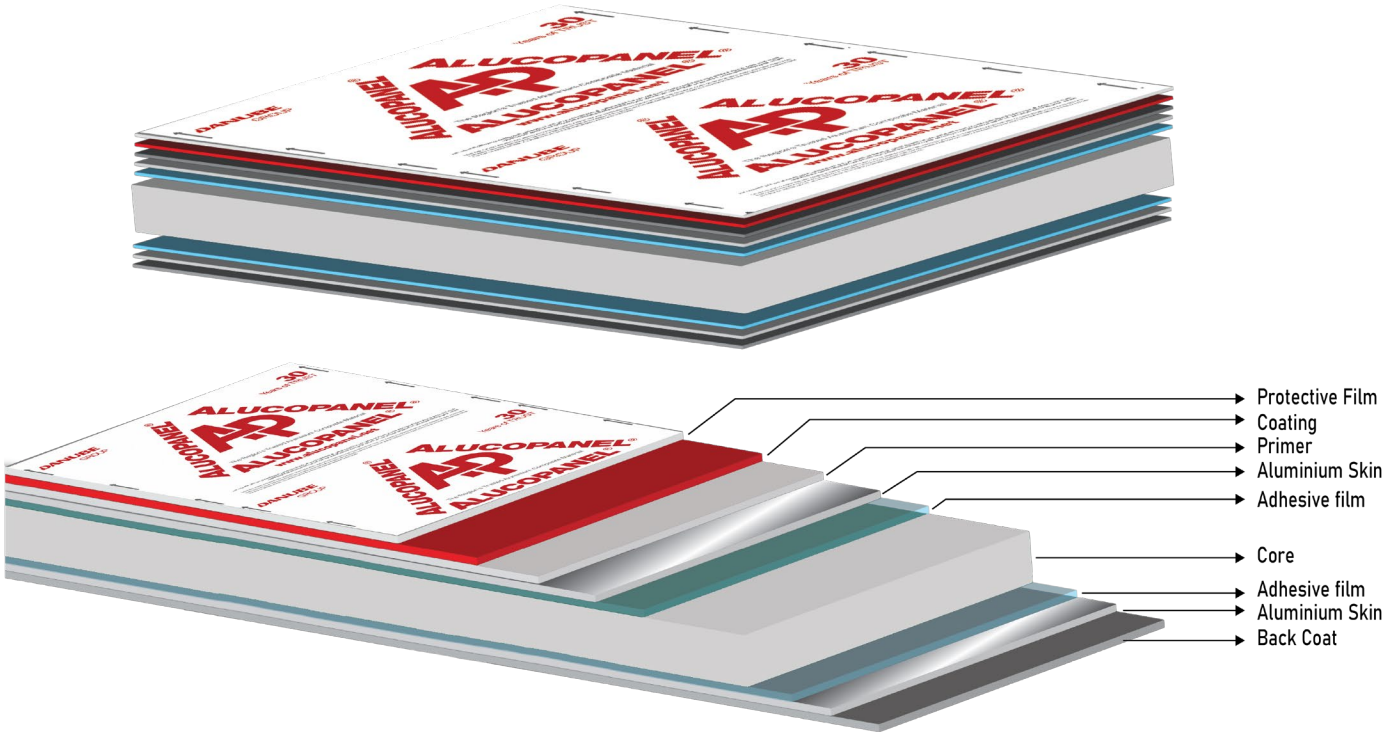
Environmental Product Declaration	Alucopanel Middle East LLC | Alucosign® FR

VERIFIED by SCS Global Services

ENVIRONMENTAL PRODUCT DECLARATION

BASED ON LCA



Declaration Owner

Alucopanel Middle East LLC
P.O.Box 416557, National Industries Park, near Al Maktoum Airport Street, Dubai, United Arab Emirates
info@alucopanel.net | +971 4 880 7939 | https://alucopanel.net/

Product:

ALUCOSIGN FR Core

Functional Unit

The functional unit is one square meter of sandwich panels

EPD Number and Period of Validity

SCS-EPD-10188
EPD Valid: June 14, 2024 through June 13, 2029
Version: July 16, 2024

Product Category Rule

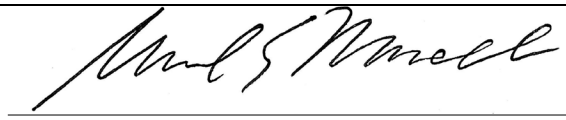
IBU PCR Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, v1.3, August 31, 2022

IBU Part B: Requirements on the EPD for Double skin metal faced sandwich panels. Version 1.0. April 2023.

Program Operator

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
+1.510.452.8000 | www.SCSglobalServices.com

SCSglobal SERVICES

Declaration owner:	Alucopanel Middle East LLC
Address:	P.O.Box 416557, National Industries Park, near Al Maktoum Airport Street, Dubai, United Arab Emirates
Declaration Number:	SCS-EPD-10188
Date of Issue:	July 16, 2024
Declaration Validity Period:	June 14, 2024 through June 13, 2029
Program Operator:	SCS Global Services, 2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
General Program Instructions:	SCS Type III Environmental Declaration Program: Program Operator Manual. V11.0
Product(s):	ALUCOSIGN FR
Declared Unit or Functional Unit:	One square meter of sandwich panels
Product's Intended Application and Use:	For use as insulated cladding in commercial buildings.
Product RSL (if applicable):	75 years
Markets of Applicability:	Middle East
EPD Type:	Product specific
EPD Scope:	Cradle to Grave
Year(s) of Reported Manufacturer Primary Data:	2022
LCA Software & Version Number:	OpenLCA 2.0.2
LCI Database(s) & Version Number:	Ecoinvent 3.9.1
LCIA Methodology & Version Number:	EN15804 + A2 Method
Reference PCR:	.IBU Part B: Requirements on the EPD for Double skin metal faced sandwich panels. Version 1.0. April 2023.
LCA Practitioner:	Riley Tesman, SCS Global Services
Independent critical review of the LCA and data, according to ISO 14044 and the PCR:	☒internal ☐ external
LCA Reviewer:	 Gerard Mansell, SCS Global Services
Independent verification of the declaration and data, according to ISO 14025 and the PCR:	☒ external ☐ internal
EPD Verifier:	 Thomas Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	1. Alucopanel® Middle East LLC....3 2. PRODUCT....3 3. Methodological Framework....4 4. Technical Information and Scenarios....9 5. LCA: Results....12 6. LCA: Interpretation....14 7. Additional Environmental Information....15 8. References....16

Disclaimers: *An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication.*

Conformity: *This EPD conforms to ISO 14025:2006, and EN 15804:2012+A2:2019/AC:2021*

Ownership: *The EPD owner has the sole ownership, liability, and responsibility of the EPD.*

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

Comparability: *Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of environmental performance using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under this PCR. Full conformance with this 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 in results for upstream or downstream of the life cycle stages declared.*

1. Alucopanel® Middle East LLC

Alucopanel® Middle East LLC dedicatedly supplies, designs and manufactures A1 grade aluminum composite panels adhering to the international best practices and fully in compliance with Latest Edition of UAE Fire & Life Safety Guidelines. Alucopanel® composite panels are a sustainable alternative to facade materials made of metal or other cladding.

The Alucopanel® products are manufactured at the Alucopanel® facility in Dubai, United Arab Emirates. The products consist of fire-retardant and non-flammable core materials with Aluminium skins on the front and back. Detailed product specifications and performance results can be found at the manufacturer's website: https://alucopanel.net/.

2. PRODUCT

2.1 PRODUCT DESCRIPTION

ALUCOSIGN® FR is respectively composed of two sheets of High Grade 1100 aluminum alloy H16 temper with 0.30 mm thickness on Top (Coated with high quality PVDF paint comes in various finishes such as Solid Colors and Metallic colors) and bottom (primer coated) that is sandwiched with mineral filled, flame retardant core material. Thus ALUCOPANEL® FR and ALUCOSIGN® FR achieved limited combustible reaction to fire classification "Class B -s1, d0" when tested in accordance to European Standard EN 13501-1.

2.2 PRODUCT SPECIFICATION

Alucopanel® products belong to the Wall Panels specification code, CSI code 07 42 13.19 (Insulated Metal Wall Panels) and the following UNSPSC codes:

- 30150000 (Exterior finishing materials)
- 30151500 (Roofing materials)
- 30151514 (Metal roof tile)
- 30151601 (Roof Fascias)
- 30151602 (Flashings)
- 30151608 (Soffits)
- 30151800 (Siding and exterior wall materials)
- 30151900 (Finishing materials and products)
- 30151902 (Canopy)
- 30151903 (Structural canopy)
- 30152000 (Fencing)
- 30152001 (Metal fencing)

2.3 APPLICATION

The Alucopanel® products provide the primary function of providing thermally insulated facades for various commercial building applications.

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2.4 TECHNICAL DATA

Table 1. Technical specification for the Alucosign® FR product.

Technical Data	Unit	Value
Density of the insulation	kg/m³	1800 kg/m³
Thickness of the product when the outer layers are flat (this is the overall height of the product	Mm	4
Thickness of the outer layer	M	0.0003
Calculation value for thermal conductivity of the insulation	W/mK	0.12
Heat transfer coefficient of the total product including heat bridges due to overlap and fixing elements	W/m²K	-
Airborne sound reduction Rw(C:Ctr); test according to EN ISO 140-3	dB	-
Sound absorption coefficient test according to EN ISO 354	%	-

2.5 DELIVERY STATUS

Table 2. Product delivery information for the Alucosign® FR product.

Technical Data	Tolerance	Unit	Value
Panel Thickness	(±) 0.2 mm	mm	4.0
Weight of the Panel	(±) 0.5 kg/m³	kg/m³	7.7
Standard Width	(±) 2 mm	mm	1000, 1250, 1500 mm
Length	(±) 2 mm	mm	Up to 6000 mm Max. 8000 mm
Skin Thickness (Top/Bottom)	(±) 0.02 mm	mm	0.30

3. Methodological Framework

3.1 FUNCTIONAL UNIT

According to ISO 14044, the functional unit is "the quantified performance of a product system, for use as a reference unit." Aluminum Composite Material are intended to be laid with overlapping edges in roofs, outer walls, wall paneling, walls, and suspended ceilings inside the building envelope with insulating materials in the core that act as a barrier against the transmission of heat. Alucopanel® products are installed in all type of buildings.

Based on the Part B PCR, the functional unit for the Alucopanel® products is defined as 1 m² of sandwich panels.

Table 3. Functional unit for the Alucosign® FR product.

Name	Value	Unit
Declared Functional Unit	1	m²
Mass	7.5	kg/m²
Layer Thickness	4	mm

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, maintenance, and product disposal. The life cycle phases included in the EPD scope are described in Table 4 and Figure 2.

Table 4. System boundary for Alucosign® FR product.

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	X

X = Module Included | MND = Module Not Declared

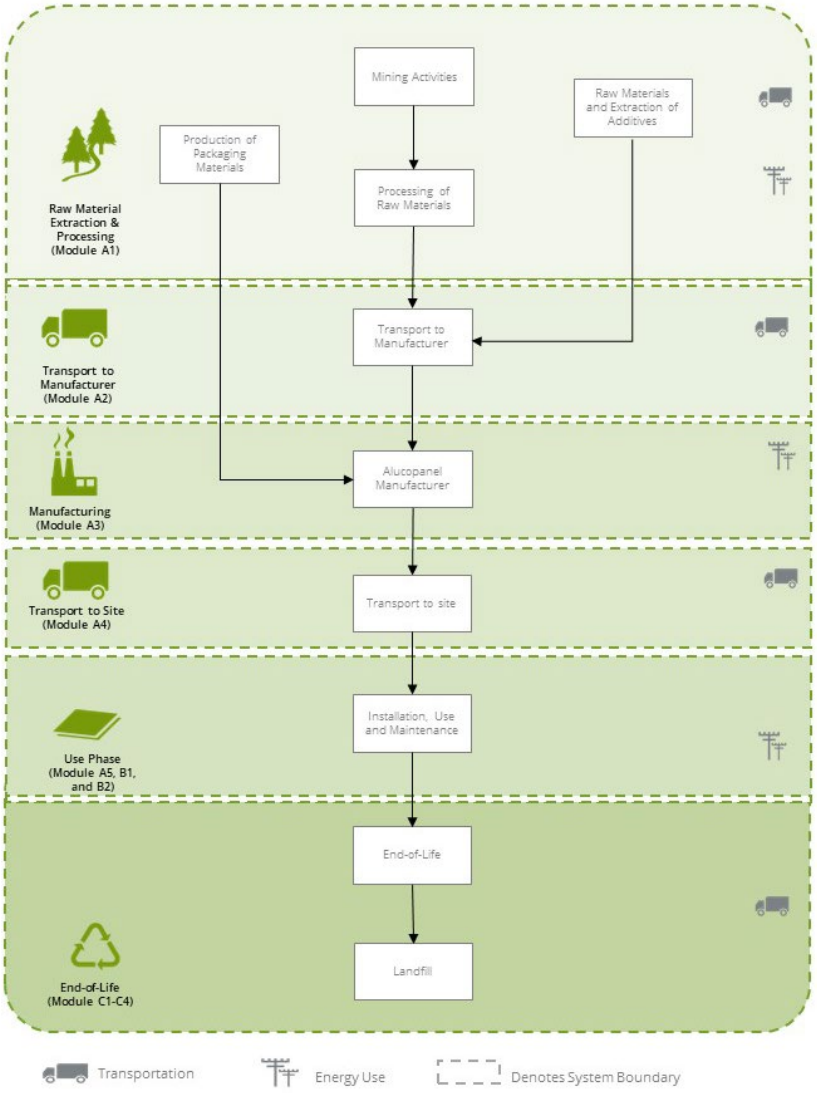


Figure 2. System boundary.

3.3 ESTIMATES AND ASSUMPTIONS

- Specific data were not available on proprietary materials for the Alucopanel® cores in the product recipe. Secondary datasets were used from the Ecoinvent database.
- The manufacturer considers the specific supplier data to be proprietary, to the transportation distances for all raw materials was assumed to be 500 km by truck.
- Manufacturing waste transport is assumed to be 50 km by truck.
- Packaging transport from suppliers to the manufacturing sites was assumed to be 250 km by truck.
- Wooden pallets used for distribution were excluded from the model as they are typically re-used and utilized in multiple product systems.
- Final product distribution is assumed to be 452.5 km by truck to represent distribution throughout the Middle East.
- Installation is assumed to use additional materials as noted in Section 5.6, based on the installation instructions provided on the Alucopanel®.
- Product waste from installation is assumed to be 0%.
- Transport of the packaging waste at installation is assumed to be 50 km by truck.
- Packaging waste is assumed disposed in landfill.
- The product is assumed to require cleaning twice per year, using a 1% sodium lauryl sulfate solution.
- The product is assumed to require no repair or refurbishment over its service life.
- The product is assumed to have a Reference Service Life of 80 years as recommended by the manufacturer, and therefore is expected to last the Expected Service Life (ESL) of the building which is assumed to be 75 years.
- The product is assumed to required no operational energy or operational water use during its service life.
- Transport of the product at end-of-life to waste processing and disposal is assumed to be 50 km.
- For the product end-of-life, disposal of product is assumed to be 90% recycled and 10% landfilled.

3.4 CUT-OFF RULES

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD.

3.5 DATA SOURCES

The life cycle inventory (LCI) of each unit process comprises material and energy inputs, emissions, and wastes. Primary data, as well as datasets from commercial LCI databases are used to model each unit process within the product system and include data quantifying the elementary and technology flows necessary to calculate environmental impacts in the LCIA phase. These include the following general types of data:

- Inputs from nature: biotic and abiotic resources;
- Inputs from the technosphere: ancillary materials, services such as waste management and transport, energy inputs, etc; and
- Outputs to nature: emission to air, water, and soil.

To the extent available, primary data are used for foreground processes (e.g., product manufacturing), while background processes are modeled using secondary data sourced from the Ecoinvent 3.9 LCI databases with a bias towards the most recent and representative data.

Unit processes were developed with the OpenLCA v2.0 LCI model, drawing data from multiple sources. Primary data were provided by Alucopanel® for the manufacturing facility in Dubai, United Arab Emirates The principal source of secondary LCI data is the Ecoinvent database. The datasets used in the LCA model to represent the manufacture of the Alucopanel® products are shown in Table 5.

Table 5. LCI datasets and associated databases used to model the Alucosign® FR product.

Flow	Dataset	Data Source	Publication Date
Raw Materials			
FR Core	Proprietary	EcoInvent 3.9	2022
Adhesive Film	market for packaging film, low density polyethylene | packaging film, low density polyethylene | Cutoff, U - GLO	EcoInvent 3.9	2022
Bottom Coil	market for aluminium alloy, metal matrix composite | aluminium alloy, metal matrix composite | Cutoff, U - GLO	EcoInvent 3.9	2022
Top Coil	market for aluminium alloy, metal matrix composite | aluminium alloy, metal matrix composite | Cutoff, U - GLO	EcoInvent 3.9	2022
PVDF	market for polyvinylfluoride | polyvinylfluoride | Cutoff, U - GLO	EcoInvent 3.9	2022
Protective Film	market for extrusion, plastic film | extrusion, plastic film | Cutoff, U - GLO market for polyethylene, low density, granulate | polyethylene, low density, granulate | Cutoff, U - GLO	EcoInvent 3.9	2022
Package Materials			
Steel Strips	market for sheet rolling, steel | sheet rolling, steel | Cutoff, U - GLO market for steel, low-alloyed | steel, low-alloyed | Cutoff, U - GLO	EcoInvent 3.9	2022
Transportation			
Transport	market for transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RoW	EcoInvent 3.9	2022
Manufacture Inputs			
Electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U - AE	EcoInvent 3.9	2022
Solar	electricity production, photovoltaic, 570kWp open ground installation, multi-Si | electricity, low voltage | Cutoff, U - RoW	EcoInvent 3.9	2022
Water	market for tap water | tap water | Cutoff, U - RoW	EcoInvent 3.9	2022
Install Materials			
Aluminum alloy 6063 U-channel 1.75*65*65*5	market for aluminium alloy, AlLi | aluminium alloy, AlLi | Cutoff, U - GLO	EcoInvent 3.9	2022
Angle cleat 20*20*65mm	market for iron-nickel-chromium alloy | iron-nickel-chromium alloy | Cutoff, U - GLO	EcoInvent 3.9	2022
Panel corner support	market for steel, low-alloyed | steel, low-alloyed | Cutoff, U - GLO	EcoInvent 3.9	2022
Maintenance			
Isopropyl Acetate	market for isopropyl acetate | isopropyl acetate | Cutoff, U - RER	EcoInvent 3.9	2022
Soap	market for soap | soap | Cutoff, U - GLO	EcoInvent 3.9	2022
Water	market group for tap water | tap water | Cutoff, U - GLO	EcoInvent 3.9	2022
Waste Outputs			
Waste	market for inert waste, for final disposal | inert waste, for final disposal | Cutoff, U - RoW	EcoInvent 3.9	2022
Wastewater	market for wastewater, average | wastewater, average | Cutoff, U - RoW	EcoInvent 3.9	2022

3.6 DATA QUALITY

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

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Table 6. Data quality assessment for the Alucosign® FR product.

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The manufacturer provided primary data on product manufacturing for the manufacturing facility in Dubai, U.A.E on annual production for 2022. Representative datasets (secondary data) for upstream and background processes are generally less than 5 years old.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative datasets for the Middle East represented in this study. Surrogate data used in the assessment are representative of global or European operations and are considered sufficiently similar to actual processes.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative component datasets, specific to the type of material, are used to represent the actual processes, as appropriate.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.9 data where available. Different portions of the product life cycle are equally considered.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of the data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data representing energy use at the manufacturing facility represents a 12-month average and is considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI data, Ecoinvent v3.9 data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the products and packaging is low. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment methodology includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.7 PERIOD UNDER REVIEW

The period of review is calendar year 2022.

3.8 GEOGRAPHIC REPRESENTATIVENESS

The Alucopanel® products are manufactured at the Alucopanel® facility in Dubai, United Arab Emirates. Transportation of final products is assumed to include truck transportation ranging throughout the Middle East

3.9 ALLOCATION

This study follows the allocation guidelines of ISO 14044 and sought to minimize the use of allocation wherever possible. In general, manufacturing facilities may produce multiple products, and in such cases, it is necessary to divide the environmental impacts between the different products. The Part A PCR and Part B PCR require the use of mass or other physical relationship (e.g., mass, volume), for allocation of multi-input and output processes. For this study of Alucopanel® products, a mass-based allocation based on the total production of finished products as provided by the Dubai facility was used. The secondary databases used for the product system apply allocation based primarily on physical relationships (e.g., volume, energy content, or mass-based relationships). Impacts from the transportation, including product distribution to the installation site, were allocated based on the mass of material and distance transported.

3.10 COMPARABILITY AND BENCHMARKING

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.

3.11 UNITS

All data and results are presented using SI units.

4. Technical Information and Scenarios

4.1 MATERIAL COMPOSITION

Table 7. Material composition summary for Alucosign® FR product

Product	Alucopanel® FR			
Materials	**Recycled Content (90%)**	**Mass Input (kg)**	**Mass Output (kg)**	**% Mass**
FR Core (3.4 mm)	5.14	5.71	5.71	76%
Top Coil	1.60	1.78	0.800	10.5%
Bottom Coil	1.60	1.78	0.800	10.5%
Adhesive Film	0.086	0.095	0.094	1%
Protective Film	0.089	0.099	0.098	1%
Total:	**8.51**	**9.46**	**7.50**	**100%**

Table 8. Biogenic composition for Alucosign® FR product

Biogenic Carbon	Unit	Alucosign® FR
Biogenic carbon content in product:	kg C	0.0
Biogenic Carbon Content in Packaging	kg C	0.0

4.2 MANUFACTURE

The Alucopanel® products are manufactured in Dubai, United Arab Emirates. The Alucopanel® products are made through a manufacturing process in which a proprietary Alucopanel Core is fed through a Conveyor Oven. Once heated

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these cores are layered with an adhesive and aluminum coil rolled and pressed onto the panel. These panels are then fed into a second conveyor oven and then subsequently undergo a cooling process. Panels are then inspected before a protective film is rolled onto the finished panels. Finally, FR panels are packaged for shipping. The Alucopanel® manufacturing facility is supported by on-site solar energy generation as verified by Dubai Energy and Water Authority.

4.3 PACKAGING

Table 9. Packaging summary for Alucosign® FR product.

Packaging Material	Unit	Alucosign® FR
Steel Binding Strips	kg	0.5
Total	**kg**	**0.5**

4.4 TRANSPORTATION

Transportation distance and mode from the manufacturing facility to distribution and installation was included in the study. Transportation of final products is assumed to include truck transportation ranging throughout the Middle East Region for distribution. Modeling parameters for product distribution, by transport mode and distance, are summarized in Table 10.

Table 10. Distribution transportation summary for Alucosign® FR product.

Name	Unit	Value
Fuel type		Diesel
Liters of fuel	l/100km	35
Vehicle type		Truck
Transport distance	km	452.5
Capacity utilization (including empty runs, specify whether mass or volume based)	%	-
Gross density of product transported	kg/m3	-
Capacity utilization volume factor		1

4.5 INSTALLATION IN THE BUILDING

Installation of the product is included in the life cycle of the Alucopanel® products. Per the manufacturer website for Alucopanel® products, panels may be attached through use of various brackets, sealants and cleats. Installation waste is assumed to be 0% of the product, as well panels are expected to overlap as necessary. Waste generated from the disposal of the packaging material from installation is assumed to be disposed in landfill. Table 11 summarizes the modeling parameters for the Alucopanel® products installation phase.

Table 11. Installation summary for Alucosign® FR products.

Name	Unit	Value
Auxiliary	kg	0.193
Water Consumption	m^3	0
Other resources	kg	0
Electricity consumption	kWh	0
Other energy carriers	MJ	0
Material Loss	kg	0
Output substances following waste treatment on site	kg	0
Direct emissions to ambient air, soil and water	kg	0
VOC emissions	kg	0

4.6 REFERENCE SERVICE LIFE AND ESTIMATED BUILDING SERVICE LIFE

The product is assumed to have a Reference Service Life of 75 years as recommended by the manufacturer, and therefore is expected to last the Expected Service Life (ESL) of the building which is assumed to be 75 years. Additional service life information can be found in Table 12.

Table 12. Reference Service Life (RSL) summary for Alucosign® FR product.

RSL	Alucosign® FR
Reference Service Life	75 years
Life span according to the manufacturer	80 years
Usage conditions	Installation as described above in Section 5.6.
Maintenance	Maintenance as described above in Section 5.7.
Repair	No repair anticipated.
Replacement	No replacement anticipated.

4.7 PRODUCT USE

Impacts for the use phase are included in the life cycle of the Alucopanel® products. Module B2 (Maintenance) is the only use phase module with activity in the life cycle of the Alucopanel® products, requiring regular cleaning at the recommendation of the manufacturer. However, specific information on the number of cleanings per year and cleaning materials was not specified by the manufacturer. An assumption of cleaning twice per year with 500 ml of 1% sodium lauryl sulfate solution per 100 m^2 as indicated in the North American PCR for Insulated Metal Panels was used. Table 13 summarizes the relevant information for the Module B2 technical scenario for the Alucopanel® products.

Table 13. Maintenance summary for Alucosign® FR product.

Maintenance (B2)	Unit	Alucosign® FR
Assumptions for scenario development	500 ml of 1% sodium lauryl sulfate solution, twice per year per 100 m^2	
Maintenance cycle	Number/RSL	150
Water consumption	m^3	0.01
Auxiliary	ml	0
Other resources	kg	0.1
Electricity consumption	kWh	0
Other energy carriers	MJ	0
Material loss	kg	0

All other use phase modules are assumed to require no additional resources or energy and will incur no impacts. As the Reference Service Life of the product is expected to last at least as long as the Estimated Service Life of the building, no replacements of the product are required in Module B4. The RSL applies to the reference in-use conditions only.

4.8 END-OF-LIFE

Impacts for deconstruction and dismantling processes (Module C1) are assumed to be zero as there are currently no methods for distinguishing impacts of demolition for double skin insulated metal panels from other construction waste during the removal of the product. Transport of the waste material at end-of-life is assumed to be 50 km. Module C3 (Waste Processing) is also not applicable to this study as the end-of-life disposal is assumed to be 90% recycled and 10% landfilled. Table 14 summarizes the relevant information for the end-of-life of the Alucopanel® products.

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Table 14. End-of-Life summary for Alucosign® FR products.

Name	Unit	Value
Assumptions for scenario development		Mixed deconstruction, followed by 50 km truck transport to final disposal in landfill
Collected separately waste type	kg	0
Collected as mixed construction waste	kg	8
Reuse	kg	0
Recycling	kg	6.75
Energy Recovery	kg	0
Landfill	kg	0.750

4.9 RE-USE PHASE

It is estimated that 90% of the Alucosign FR core is recycled while 10% is disposed. Benefits and loads are reported in Module D as required by EN15804 + A2.

After production, trimmed core wastages are sold to scrap buyers where core materials are fully recycled by scrap buyers to be used again in Alucopanel production, ensuring minimal waste to landfills. Core materials are transported to the facility in both granular and roll forms. Recycled core is then processed in the Dubai facility before sandwiching the core with aluminum skins on both sides.

5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The following environmental impact category indicators are reported using characterization factors based on the EN 15804+A2 characterization method as required by the PCR. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Table 15. Impact assessment categories.

Impact Category	Unit
Global warming potential **(GWP-total)** **(GWP-fossil)** **(GWP-biogenic)** **(GWP-luluc)**	kg CO_2 eq
Ozone depletion potential **(ODP)**	kg CFC-11 eq
Eutrophication potential **(EP-freshwater)** **(EP-aquatic marine)** **(EP-terrestrial)**	kg P eq kg N eq mol N eq
Acidification potential **(AP)**	mol H^+ eq
Photochemical ozone formation **(POCP)**	kg NMVOC eq
Abiotic Depletion Potential, non-fossil resources **(ADPminerals)**†	kg Sb eq
Abiotic Depletion Potential, fossil fuels **(ADPfossil)**†	MJ eq
Water Use Deprivation Potential **(WDP)**†	m^3 world eq deprived

†The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

The following inventory parameters, specified by the PCR, are also reported. The parameters are calculated based on the ACLCA ISO 21930 Guidance. The additional required parameters are presented in Tables 16 and 17.

Table 16. Additional transparency parameters for Resource Use.

Indicator	Unit
Renewable primary resources used as an energy carrier **(PERE)**	MJ, LHV
Renewable primary resources with energy content used as materials **(PERM)**	MJ, LHV
Total use of renewable primary energy resources **(PERT)**	MJ, LHV
Non-renewable primary resources used as an energy carrier **(PENRE)**	MJ, LHV
Non-renewable primary resources with energy content used as material **(PENRM)**	MJ, LHV
Total us of non-renewable primary energy resources **(PENRT)**	MJ, LHV
Secondary materials **(SM)**	kg
Renewable secondary fuels **(RSF)**	MJ, LHV
Non-renewable secondary fuels **(NRSF)**	MJ, LHV
Consumption of freshwater **(FW)**	m^3

Table 17. Additional transparency parameters for Waste and Output Flows.

Indicator	Unit
Hazardous waste disposed **(HWD)**	kg
Non-hazardous waste disposed **(NHWD)**	kg
Radioactive waste **(RWD)**	kg
Components for re-use **(CRU)**	kg
Materials for recycling **(MFR)**	kg
Materials for energy recovery **(MER)**	kg
Exported electrical energy **(EEE)**	MJ, LHV
Exported thermal energy **(EET)**	MJ, LHV

Table 18. Environmental Impact Results for Alucosign® FR products per functional unit.

	Units	A1	A2	A3	A1-A3 Total:	A4	A5	B2	C2	C4	D
GWP-total	**kg CO_2 eq**	2.24	0.428	1.31	**3.98**	0.579	1.36	$7.59x10^{-4}$	0.072	0.007	-1.90
GWP-fossil	**kg CO_2 eq**	2.23	0.428	1.31	**3.97**	0.579	1.34	$7.46x10^{-4}$	0.072	0.007	-1.90
GWP-biogenic	**kg CO_2 eq**	0.003	$1.13x10^{-4}$	$5.69x10^{-4}$	**0.003**	$5.69x10^{-4}$	0.003	$1.18x10^{-5}$	$1.88x10^{-5}$	$2.70x10^{-6}$	$-2.10x10^{-3}$
GWP-luluc	**kg CO_2 eq**	0.003	$2.23x10^{-4}$	$3.40x10^{-4}$	**0.004**	$2.40x10^{-4}$	0.010	$7.54x10^{-7}$	$3.73x10^{-5}$	$1.15x10^{-5}$	$-2.83x10^{-3}$
OPD	**kg CFC 11 eq**	$1.05x10^{-7}$	$6.77x10^{-9}$	$7.70x10^{-8}$	**$1.89x10^{-7}$**	$1.27x10^{-7}$	$2.34x10^{-8}$	$4.26x10^{-11}$	$1.13x10^{-9}$	$1.75x10^{-10}$	$-7.84x10^{-8}$
AP	**mol H^+ eq**	0.012	0.002	0.002	**0.015**	0.003	0.019	$4.47x10^{-6}$	$4.47x10^{-6}$	$4.79x10^{-5}$	$-9.60x10^{-3}$
EP-freshwater	**kg P eq**	$7.51x10^{-4}$	$3.48x10^{-5}$	$8.99x10^{-5}$	**$8.76x10^{-4}$**	$4.39x10^{-5}$	0.001	$3.01x10^{-7}$	$5.81x10^{-6}$	$6.52x10^{-7}$	$-6.36x10^{-4}$
EP-marine	**kg N eq**	0.003	$6.87x10^{-4}$	$5.31x10^{-4}$	**0.004**	0.001	0.002	$8.90x10^{-7}$	$1.15x10^{-4}$	$1.86x10^{-5}$	$-2.60x10^{-3}$
EP-terrestrial	**mol N eq**	0.032	$6.87x10^{-4}$	0.006	**0.038**	0.011	0.023	$8.76x10^{-6}$	0.001	$1.99x10^{-4}$	-0.026
POCP	**kg NMVOC eq**	0.012	0.003	0.002	**0.016**	0.003	0.008	$3.34x10^{-6}$	$4.22x10^{-4}$	$6.79x10^{-5}$	$-9.84x10^{-3}$
ADP-minerals	**kg Sb eq**	$2.30x10^{-5}$	$1.41x10^{-6}$	$7.89x10^{-6}$	**$3.23x10^{-5}$**	$2.05x10^{-6}$	$2.86x10^{-4}$	$9.61x10^{-9}$	$2.36x10^{-7}$	$1.45x10^{-8}$	$-1.52x10^{-5}$
ADP-fossil	**MJ**	36.4	6.10	23.0	**65.5**	8.72	16.2	0.023	0.023	0.151	-31.0
WDP	**m^3**	1.01	0.029	0.299	**1.34**	0.037	2.47	0.002	0.005	$6.91x10^{-4}$	-0.788

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Table 19. Resource use indicator results for Alucosign® FR products per functional unit.

	Units	A1	A2	A3	A1-A3 Total:	A4	A5	B2	C2	C4	D
PERE	**MJ, LHV**	1.96	0.077	7.06	**9.10**	0.100	8.46	0.014	0.014	0.002	-1.67
PERM	**MJ, LHV**	0	0	0	**0**	0	0	0	0	0	0
PERT	**MJ, LHV**	1.96	0.077	7.06	**9.10**	0.100	8.46	0.014	0.014	0.002	-1.67
PENRE	**MJ, LHV**	36.1	6.06	22.1	**64.2**	8.67	16.0	0.023	1.11	0.150	-30.8
PENRM	**MJ, LHV**	0	0	0	**0**	0	0	0	0	0	0
PENRT	**MJ, LHV**	36.1	6.06	22.1	**64.2**	8.67	16.0	0.023	1.11	0.150	-30.8
SM	**kg**	0	0	0	**0**	0	0	0	0	0	0
RSF	**MJ, LHV**	0	0	0	**0**	0	0	0	0	0	0
NRSF	**MJ, LHV**	0	0	0	**0**	0	0	0	0	0	0
FW	**m^3**	0.024	$7.64x10^{-4}$	0.007	**0.0316**	0.001	0.047	0.011	$1.28x10^{-4}$	$1.27x10^{-4}$	-0.018

Table 20. Waste and Output indicators for Alucosign® FR products per functional unit.

	Units	A1	A2	A3	A1-A3 Total:	A4	A5	B2	C2	C4	D
HWD	**kg**	0	0	0	**0**	0	0	0	0	0	0
NHWD	**kg**	0	0	0.780	**0.780**	0	0.5	0	0	0.750	0
RWD	**kg**	0	0	0	**0**	0	0	0	0	0	0
CRU	**kg**	0	0	0	**0**	0	0	0	0	0	0
MFR	**kg**	0	0	0	**0**	0	0	0	0	6.75	0
MER	**kg**	0	0	0	**0**	0	0	0	0	0	0
EEE	**MJ, LHV**	0	0	0	**0**	0	0	0	0	0	0
EET	**MJ, LHV**	0	0	0	**0**	0	0	0	0	0	0

6. LCA: Interpretation

The contributions to total impact indicator results for the Alucopanel® products are dominated by the A1 Raw Material module. Figure 3 shows the contribution analysis of the impact indicator results for the Alucopanel® products.

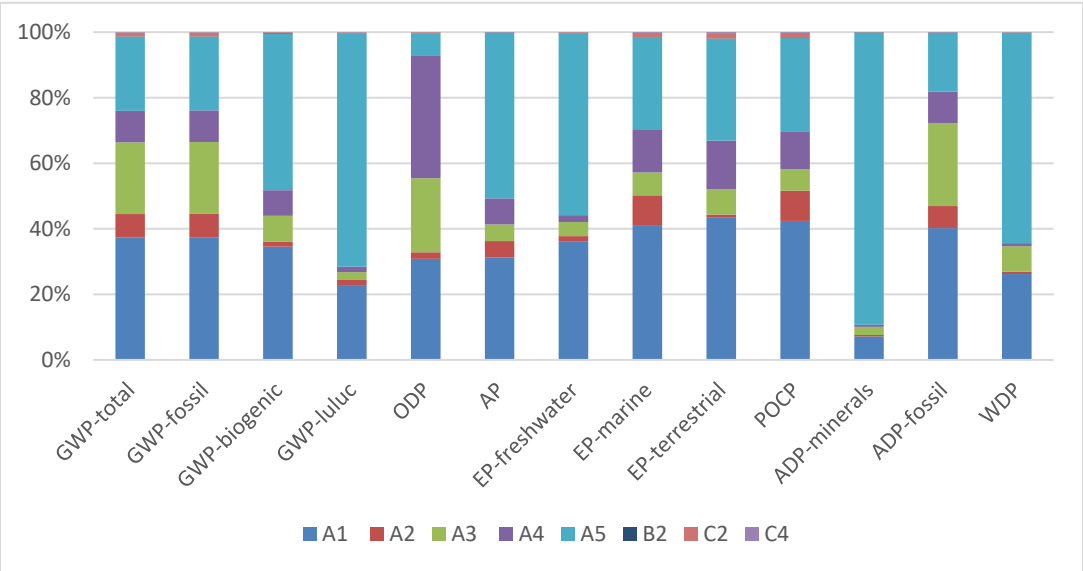


Figure 3. Contribution analysis for the Alucosign® FR products.

7. Additional Environmental Information

7.1 ENVIRONMENT AND HEALTH DURING MANUFACTURING

No environmental or health impacts are expected during the manufacture of the product.

7.2 ENVIRONMENT AND HEALTH DURING INSTALLATION

No environmental or health impacts are expected due to normal use of the products.

7.3 EXTRAORDINARY EFFECTS

No environmental or health impacts are expected due to extraordinary effects including fire and/or water damage and unforeseeable mechanical destruction.

7.4 DELAYED EMISSIONS

No delayed emissions are expected due to normal use of the products.

7.5 ENVIRONMENTAL ACTIVITIES AND CERTIFICATIONS

There are no know environmental activities and certifications.

7.6 FURTHER INFORMATION

Further information on the product can be found on the manufacturers' website: https://alucopanel.net/

8. References

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- EN 15804:A1:2012+A2:2019+AC:2021 Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

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For more information, contact:

Alucopanel Middle East LLC
P.O.Box 416557, National Industries Park, near Al Maktoum
Airport Street, Dubai, United Arab Emirates,
https://alucopanel.net/
+971 4 880 7939

SCSglobal SERVICES

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

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