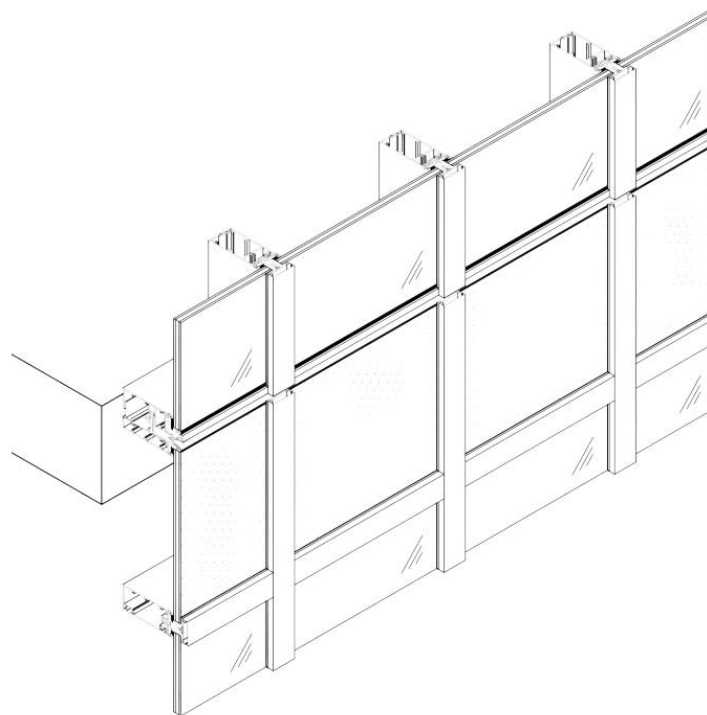


ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

Zero-Net UC3500 Unitized Curtain Wall
FreMarq Innovations



EPD HUB, HUB-0344

Publishing date 09 March 2023, last updated date 09 March 2023, valid until 09 March 2028

GENERAL INFORMATION

MANUFACTURER

Manufacturer	FreMarq Innovations
Address	1101 North Mill Street, Merrill, WI 54452
Contact details	info@fremarq.com
Website	https://www.fremarqinnovations.com/

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804+A2:2019 and ISO 14025
PCR	EPD Hub Core PCR version 1.0, 1 Feb 2022 EN 17213 Windows and doors
Sector	Manufactured product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with modules C1-C4, D
EPD author	Tyler Frederick
EPD verification	Independent verification of this EPD and data, according to ISO 14025: <input type="checkbox"/> Internal certification <input checked="" type="checkbox"/> External verification
EPD verifier	H.N, as an authorized verifier acting for EPD Hub Limited

The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT

Product name	Zero-Net UC3500 Unitized Curtain Wall
Additional labels	-
Product reference	UC3500
Place of production	United States
Period for data	October 2021 - October 2022
Averaging in EPD	No averaging
Variation in GWP-fossil for A1-A3	0 %

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 m ²
Declared unit mass	80.74 kg
GWP-fossil, A1-A3 (kgCO ₂ e)	3.44E2
GWP-total, A1-A3 (kgCO ₂ e)	3.41E2
Secondary material, inputs (%)	20.4
Secondary material, outputs (%)	31.8
Total energy use, A1-A3 (kWh)	1210.0
Total water use, A1-A3 (m ³ e)	2.11

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

FreMarq Innovations was founded in 2015 and has been developing new technologies to improve the thermal performance of curtain wall systems. FreMarq Innovations produces unitized curtain wall, pressure wall, and window wall systems that are all custom designed for each customer. FreMarq Innovations is located in Merrill, WI.

PRODUCT DESCRIPTION

The UC3500 Unitized Curtain Wall primary function is to be the envelope of a building.

The UC3500 Unitized Curtain Wall made of aluminium, PVC, rubber gaskets, silicone, and fasteners.

The materials used in packaging are wood and fasteners.

The size of the unit is 1 Meter by 1 Meter

Further information can be found at <https://www.fre-marq-innovations.com/>.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	30.89	Aluminium-US, Steel-US
Minerals	52.77	Glass Fibres from US, Glass Pane from Columbia
Fossil materials	16.34	Rubber, Silicone, PVC-US
Bio-based materials	-	Not Applicable

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C 0

Biogenic carbon content in packaging, kg C 0.50315

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit 1 m²

Mass per declared unit 80.74 kg

Functional unit -

Reference service life -

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR.

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

All the raw materials are produced outside of our factory. The manufacturing process requires electricity and fuels for the different equipment. In the factory, raw materials including aluminium, steel, glass and silicon, as well as pre-fabricated components, such as rubber gasket and screws are first put through quality check. All materials are then sorted and prepped for fabrication. The extrusions and PVC are sent to the saw and through machining centers. They are then assembled into the windows and this is where the screws and rubber silicone gaskets are

added to the windows. We then set the glass on our frames using an overhead crane. The frames move down the line on roller beds and have silicone shot between the glass and aluminium to create a seal. Once the windows are shot with silicone, we add the caps to the windows to hold the glass in place. Once the silicone is set after 4 hours we pack them into wood skids that are made from Pine Wood and fasteners. These filled crate are stored indoors and shipped on a trailer to the job site.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

Was not considered in this study.

PRODUCT USE AND MAINTENANCE (B1-B7)

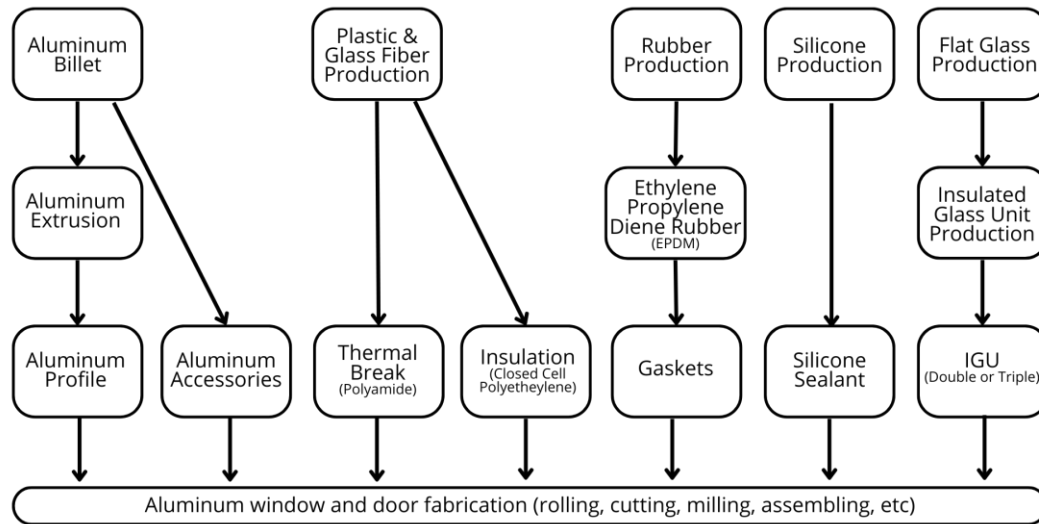
This EPD does not cover the use phase.

Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

The construction of the waste processing facility and the appropriate equipment are not a part of this model. Power tools and heavy machinery are used to remove the curtain wall into its appropriate end of life stream. Due to the material and energy recovery potential of the materials, a part of the end-of-life product is converted into recycled raw materials while electric and heat energy are generated from incineration. The wood pallet is incinerated, where the energy recovered from incineration displaces electricity and heat production. The aluminium is separated and 100% is recycled. Manufacturing waste and loss including metal scraps are sent 1328 km away to a waste manager for recycling. The rest of the materials and components are landfilled at the end of deconstruction.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	Allocated by mass or volume
Packaging materials	Allocated by mass or volume
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

AVERAGES AND VARIABILITY

Type of average	No averaging
Averaging method	Not applicable
Variation in GWP-fossil for A1-A3	0 %

There is no average result considered in this study since EPD refers to one specific product produced in one production plant.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. Ecoinvent and One Click LCA databases were used as sources of environmental data.

ENVIRONMENTAL IMPACT DATA

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total ¹⁾	kg CO ₂ e	3.15E2	1.39E1	1.18E1	3.41E2	0E0	3.41E0	MND	MND	MND	MND	MND	MND	MND	5.71E-1	3.61E-1	3.53E0	1.92E0	0E0
GWP – fossil	kg CO ₂ e	3.16E2	1.39E1	1.37E1	3.44E2	0E0	3.44E0	MND	MND	MND	MND	MND	MND	MND	5.66E-1	3.61E-1	7.23E-1	1.91E0	-8.41E1
GWP – biogenic	kg CO ₂ e	-2.25E0	9.46E-3	-1.87E0	-4.11E0	0E0	MND	MND	MND	MND	MND	MND	MND	MND	2.72E-3	2.62E-4	2.81E0	4.73E-3	-2.67E0
GWP – LULUC	kg CO ₂ e	6.11E-1	4.43E-3	1.82E-3	6.18E-1	0E0	6.18E-3	MND	MND	MND	MND	MND	MND	MND	2.48E-3	1.09E-4	8.7E-4	2.12E-4	-4.73E-1
Ozone depletion pot.	kg CFC-11e	2.87E-5	3.25E-6	1.15E-6	3.31E-5	0E0	3.31E-7	MND	MND	MND	MND	MND	MND	MND	1.3E-8	8.49E-8	8.56E-8	1.78E-7	-4.17E-6
Acidification potential	mol H ⁺ e	2.08E0	7.66E-2	4.5E-2	2.2E0	0E0	2.2E-2	MND	MND	MND	MND	MND	MND	MND	2.9E-3	1.52E-3	7.82E-3	4.82E-3	-6.32E-1
EP-freshwater ²⁾	kg Pe	1.1E-2	1.11E-4	5.89E-4	1.17E-2	0E0	1.17E-4	MND	MND	MND	MND	MND	MND	MND	9.74E-5	2.94E-6	4.17E-5	7.99E-6	-6.23E-3
EP-marine	kg Ne	3.37E-1	2.19E-2	7.45E-3	3.66E-1	0E0	3.66E-3	MND	MND	MND	MND	MND	MND	MND	3.29E-4	4.57E-4	1.73E-3	3.22E-3	-6.3E-2
EP-terrestrial	mol Ne	3.8E0	2.42E-1	8.53E-2	4.13E0	0E0	4.13E-2	MND	MND	MND	MND	MND	MND	MND	3.76E-3	5.05E-3	1.99E-2	1.82E-2	-7.16E-1
POCP (“smog”) ³⁾	kg NMVOCe	1.08E0	7.44E-2	2.44E-2	1.18E0	0E0	1.18E-2	MND	MND	MND	MND	MND	MND	MND	1.03E-3	1.62E-3	5.45E-3	5.55E-3	-2.4E-1
ADP-minerals & metals ⁴⁾	kg Sbe	1.18E-2	2.31E-4	3.56E-5	1.2E-2	0E0	1.2E-4	MND	MND	MND	MND	MND	MND	MND	2.97E-6	6.16E-6	3.41E-5	5.88E-6	-3.09E-4
ADP-fossil resources	MJ	3.74E3	2.15E2	2.4E2	4.19E3	0E0	4.19E1	MND	MND	MND	MND	MND	MND	MND	6.67E0	5.62E0	8.88E0	1.31E1	-7.32E2
Water use ⁵⁾	m ³ e depr.	1.08E2	7.86E-1	3.33E-2	1.09E2	0E0	1.09E0	MND	MND	MND	MND	MND	MND	MND	1.65E-1	2.09E-2	1.41E-1	6.01E-1	-2.36E-1

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy ⁶⁾	MJ	3.29E2	2.66E0	1.18E1	3.44E2	0E0	3.44E0	MND	MND	MND	MND	MND	MND	MND	1.24E0	7.07E-2	1.21E0	1.72E-1	-3.36E2
Renew. PER as material	MJ	0E0	0E0	2.11E1	2.11E1	0E0	2.11E-1	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	-2.11E1	0E0	2.11E1
Total use of renew. PER	MJ	3.29E2	2.66E0	3.28E1	3.65E2	0E0	3.65E0	MND	MND	MND	MND	MND	MND	MND	1.24E0	7.07E-2	-1.98E1	1.72E-1	-3.15E2
Non-re. PER as energy	MJ	3.55E3	2.15E2	2.4E2	4E3	0E0	4E1	MND	MND	MND	MND	MND	MND	MND	6.67E0	5.62E0	8.88E0	1.31E1	-7.32E2
Non-re. PER as material	MJ	3.25E2	0E0	0E0	3.25E2	0E0	3.25E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	-3.25E2	0E0
Total use of non-re. PER	MJ	3.87E3	2.15E2	2.4E2	4.33E3	0E0	4.33E1	MND	MND	MND	MND	MND	MND	MND	6.67E0	5.62E0	8.88E0	-3.12E2	-7.32E2
Secondary materials	kg	1.64E1	0E0	3.7E-2	1.65E1	0E0	1.65E-1	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	6.35E0
Renew. secondary fuels	MJ	1.68E-3	0E0	0E0	1.68E-3	0E0	1.68E-5	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m ³	2.02E0	4.38E-2	4.89E-2	2.11	0E0	2.11E-2	MND	MND	MND	MND	MND	MND	MND	2.98E-3	1.17E-3	3.72E-3	1.5E-2	-3.55E-1

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	4.48E1	2.1E-1	1.69E0	4.67E1	0E0	4.67E-1	MND	MND	MND	MND	MND	MND	MND	2.13E-2	5.46E-3	0E0	2.02E-2	-2.26E1
Non-hazardous waste	kg	4.57E2	2.23E1	2.31E1	5.02E2	0E0	5.02E0	MND	MND	MND	MND	MND	MND	MND	4.55E0	6.04E-1	0E0	5.52E1	-2.78E2
Radioactive waste	kg	7.32E-3	1.48E-3	1.03E-3	9.83E-3	0E0	9.83E-5	MND	MND	MND	MND	MND	MND	MND	1.93E-5	3.86E-5	0E0	8.05E-5	-1.48E-3

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	2.43E1	0E0	0E0
Materials for energy rec	kg	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	1.39E0	0E0	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ e	3.04E2	1.38E1	1.33E1	3.32E2	0E0	3.32E0	MND	MND	MND	MND	MND	MND	MND	5.6E-1	3.58E-1	7.08E-1	1.47E0	-8.23E1
Ozone depletion Pot.	kg CFC ₁₁ e	3.28E-5	2.58E-6	1.12E-6	3.65E-5	0E0	3.65E-7	MND	MND	MND	MND	MND	MND	MND	1.55E-8	6.75E-8	7.03E-8	1.42E-7	-4.05E-6
Acidification	kg SO ₂ e	1.67E0	4.37E-2	3.45E-2	1.74E0	0E0	1.74E-2	MND	MND	MND	MND	MND	MND	MND	2.55E-3	7.35E-4	4.98E-3	4.6E-3	-3.97E-1
Eutrophication	kg PO ₄ ³ e	4.51E-1	7.31E-3	1.72E-2	4.75E-1	0E0	4.75E-3	MND	MND	MND	MND	MND	MND	MND	3.05E-3	1.48E-4	1.92E-3	6.23E-2	-2.24E-1
POCP ("smog")	kg C ₂ H ₄ e	8.69E-2	2.15E-3	1.79E-3	9.08E-2	0E0	9.08E-4	MND	MND	MND	MND	MND	MND	MND	9.47E-5	4.66E-5	2.31E-4	3.17E-4	-3.31E-2
ADP-elements	kg Sbe	1.18E-2	2.31E-4	3.56E-5	1.2E-2	0E0	1.2E-4	MND	MND	MND	MND	MND	MND	MND	2.97E-6	6.16E-6	3.41E-5	5.88E-6	-3.09E-4
ADP-fossil	MJ	3.74E3	2.15E2	2.4E2	4.19E3	0E0	4.19E1	MND	MND	MND	MND	MND	MND	MND	6.67E0	5.62E0	8.88E0	1.31E1	-7.32E2

ENVIRONMENTAL IMPACTS – TRACI 2.1. / ISO 21930

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ e	3.06E2	1.38E1	1.33E1	3.33E2	0E0	3.33E0	MND	MND	MND	MND	MND	MND	MND	5.61E-1	3.57E-1	7.08E-1	1.53E0	-8.19E1
Ozone Depletion	kg CFC ₁₁ e	3.19E-5	3.44E-6	1.57E-6	3.69E-5	0E0	3.69E-7	MND	MND	MND	MND	MND	MND	MND	2.06E-8	8.99E-8	9.36E-8	1.89E-7	-4.77E-6
Acidification	kg SO ₂ e	3.9E0	6.62E-2	3.86E-2	4E0	0E0	4E-2	MND	MND	MND	MND	MND	MND	MND	2.38E-3	1.32E-3	6.62E-3	4.36E-3	-5.27E-1
Eutrophication	kg Ne	1.4E-1	7.62E-3	5.56E-3	1.53E-1	0E0	1.53E-3	MND	MND	MND	MND	MND	MND	MND	7.49E-4	1.86E-4	6.2E-4	2.18E-3	-5.6E-2
POCP (“smog”)	kg O ₃ e	2.04E1	1.39E0	4.63E-1	2.23E1	0E0	2.23E-1	MND	MND	MND	MND	MND	MND	MND	2.06E-2	2.9E-2	1.09E-1	1.05E-1	-4E0
ADP-fossil	MJ	3.21E2	3.08E1	1.66E1	3.68E2	0E0	3.68E0	MND	MND	MND	MND	MND	MND	MND	1.57E-1	8.05E-1	9.29E-1	1.85E0	-3.73E1

VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with reference standard, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The digital background data for this EPD

Why does verification transparency matter? Read more online
This EPD has been generated by One Click LCA EPD generator, which has been verified and approved by the EPD Hub.

THIRD-PARTY VERIFICATION STATEMENT

I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of the data collected and used in the LCA calculations, the way the LCA-based calculations have been carried out, the presentation of environmental data in the EPD, and other additional environmental information, as present with respect to the procedural and methodological requirements in ISO 14025:2010 and reference standard.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

HaiHa Nguyen, as an authorized verifier acting for EPD Hub Limited
09.03.2023

