ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

EPD of multiple products (FAÇADE)
Unitized Curtain Wall;
Unitized Window Wall;
Stick Curtain Wall;
Storefront Framing;
Aluminium Solid Panel;
Aluminium Composite Panel.
(EPD of multiple products, based on a representative product)
from
QUAN DAT TRADING AND PRODUCTION COMPANY LIMITED

Programme:
The international EPD® system, www.environdec.com
EPD registered through the fully aligned regional hub EPD Southeast Asia,
https://www.epd-southeastasia.com/
Programme operator:
EPD International AB
Regional Hub
EPD Southeast Asia
EPD registration number: EPD-IES-0004578 (S-P-04578)
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Geographical scope: Vietnam

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 at www.environdec.com.

GENERAL INFORMATION

PROGRAMME INFORMATION

Programme Operator	
THE INTERNATIONAL EPD® SYSTEM **EPD International AB** Box 210 60 100 31 Stockholm Sweden www.environdec.com	SOUTHEAST ASIA EPD THE INTERNATIONAL EPD SYSTEM **EPD Southeast Asia** Kencana Tower Level M, Business Park Kebon Jeruk Jl Raya Meruya Ilir No. 88 Jakarta Barat 11620, Indonesia admin@epd-southeastasia.com www.epd-southeastasia.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
PCR 2019:14 Construction products, version 1.3.4 (2024-04-30) c-PCR-007, Windows and doors, version 2024-04-30
PCR review was conducted by: Martin Erlandsson, IVL Swedish Environmental Research Institute, martin.erlandsson@ivl.se
Life Cycle Assessment (LCA)
LCA accountability: *Le Van Tam, tamvan68@gmail.com*
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: *Anni Oviir, Rangi Maja OÜ, https://www.lcasupport.com/* Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

It is important to note that the results presented in modules A1-A3 should not be used in isolation without also considering the results of module C.

The EPD's declared environmental impacts are based on a representative product, so using it for significantly different variants may lead to inaccurate assessments.

MANUFACTURER INFORMATION

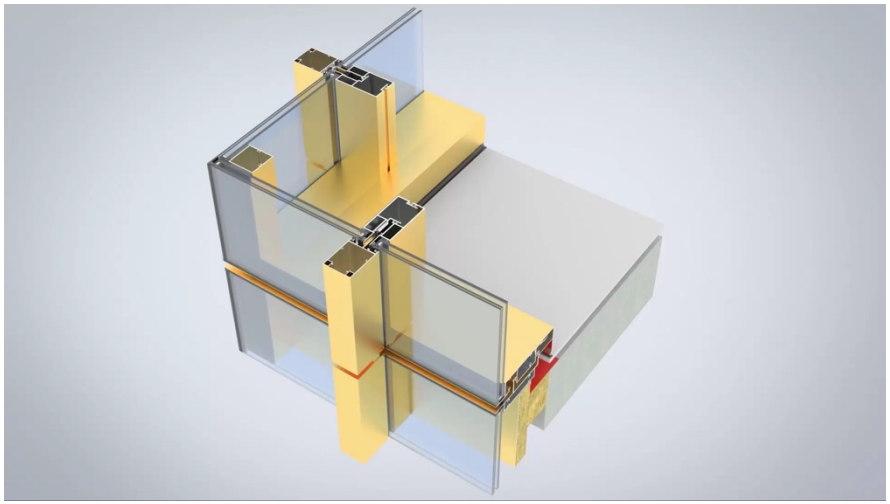
Manufacturer	**QUAN DAT TRADING AND PRODUCTION COMPANY LIMITED**
Address	536 Quang Trung, Ward 11, Go Vap District, Ho Chi Minh City, Vietnam
Contact details	project@quandat.com.vn
Website	www.quandat.com.vn
Product-related or management system-related certifications	ISO 9001:2015; ISO 14001:2015; ISO 45001:2018. The certificates issued by NQA and accredited by UKAS

PRODUCT INFORMATION

PRODUCT DESCRIPTION

Façade is fundamental components that significantly influence a building aesthetic appeal, performance, and functionality. While the façade refers to the exterior front or any external side of a building, cladding is the application of one material over another to provide a protective or decorative layer.

The EPD is an EPD of multiple products that represent various product versions, with different sizes and designs. The result presented in the EPD is the result of the representative product 'Unitized Curtain Wall'.



PRODUCT IDENTIFICATION

Product name	FAÇADE
Additional label(s)	-
Product number / reference	Unitized Curtain Wall; Unitized Window Wall; Stick Curtain Wall; Storefront Framing; Aluminium Solid Panel; Aluminium Composite Panel.
Place(s) of production	No. 85A, DT748 Street, An Dien Ward, Ben Cat City, Binh Duong Province, Vietnam
CPC code	42120-Doors, windows and their frames and thresholds for doors, of iron, steel or aluminium

PRODUCT APPLICATION

Suitable for both residential and commercial buildings.

TECHNICAL SPECIFICATION:

Name of Criterion	Level	Test Method
1. Impact Resistance	Indentation depth not greater than 2 mm with a test sample weight of 3 kg ± 0.5 kg	AS 2688:2017
2. Water Tightness	No water streaks appear on the inside surface with a test pressure greater than 300 Pa	EN 1027:2000
3. Air Permeability	Air leakage is less than 1.5 m3/m2.h corresponding to a minium pressure of 150 Pa	EN 1026:2000

PRODUCT RAW MATERIAL COMPOSITION

Product Material	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Glass	9.40	0	0
Aluminium profiles	2.11	0	0
Silicone	0.39	0	0
Rockwool	0.25	0	0
Rubber	0.21	0	0
Aluminium	0.11	0	0
Stainless steel	0.04	0	0
Steel	0.01	0	0
Paint	0.00174	0	0

PACKAGING

The windows are generally transported directly from production site to the building site by lorry. Windows are separated from each other by plastic film and corrugated board. These packaging materials are included in the scope of this EPD.

Packaging Material	Weight, kg	Weight-% (versus the product)	Biogenic material, kg C/product or declared unit
PINE WOOD	0.522	4.2%	0.23
CARDBOARD PAPER	0.242	1.9%	0.11
LONG COIL AND STRAPPING BUCKLE	0.0167	0.13%	0
PE FILM	0.0104	0.08%	0
PET PLASTIC	0.0107	0.09%	0
TAPE	0.04397	0.35%	0

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	0.34

Note: The conversion factor from kg carbon to kg CO2 (44/12).

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

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.

The production consists of five steps:
1. Aluminium profile preparation mainly via sawing, milling and gluing. Those aluminium profiles are powder coated, non-thermal break system and thermal break system.
2. Frame production by assembling the various profiles via corner connections and fixing via gluing and/or ramping. Connectors are composed of aluminium die cast.
3. Positioning and fixing the various gaskets.
4. The fittings integration (if relevant)
5. The fixing of the glazing unit via the glazing bead.

The production line primarily consumes electricity. Diesel is used in forklift for internal transport. Heating by natural gas in winter period has also been considered in this study, taking into account the location of the manufacturing plant, where certain temperature range is required for the correct functioning of the equipment. Ancillary materials include water and cleaning agent. The manufacturer estimates the wastage rate of Aluminium profiles to be 2%.
The manufacturing energy use consists of grid electricity and rooftop solar energy generated by the manufacturer's investment used to power the equipment and lighting at the production plant. Additionally, there is Diesel oil for forklifts, cutting oil used for operating CNC cutting and milling machines, kerosene for washing components and machine parts, oxygen gas used for welding, and 12kg gas used in welding machines.
Energy data was gathered from invoices and cross checked with metering. Electricity type was confirmed from contract data. Manufacturing waste consists mainly of production losses but also, Wood Waste, Waste oil residue,...Steel and Aluminium Profiles wasted in production are sold as scrap for recycling. Mixed wastes are sent to either landfill or incineration, wood to incineration and paper to recycling. Water used during production is sent to waste water treatment.
The packaging utilizes adhesive tape, PE film, pallets... to protect the product from scratches and abrasions.
In manufacturing, some assembly accessories such as nails, screws, hinges,... are used.

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.

Average distance of transportation is calculated based on the distance from the manufacturer to the project/site, which is 194km on average.
The transportation method is lorry. Vehicle capacity utilization volume factor is assumed to be 1 which means full load. In reality, it may vary but as role of transportation emissions in total results is small, the variety in load is assumed to be negligible. To be conservative, empty returns are included in this study as implemented through an average load factor in the Ecoinvent transport datapoints. Transportation does not cause losses as product is packaged properly. Distance from the construction site to waste handling facility is assumed to be 100 km.

Environmental impacts from installation into the building (A5) include emissions from energy use during installation and the generation of waste at the construction site. Due to the inability to measure specific electrical

data on-site, electrical data will be calculated based on the power consumption of the device, which is 1.2 kW/h. Regarding packaging waste, plastic film, cardboard, and steel are considered sorted for recycling, while wood is incinerated with energy recovery.

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)

To demolish the building at the end of its life cycle, assume 0.036 MJ/kg of the product (C1). Waste is delivered to the nearest construction waste treatment plant, assumed to be located 100 km from the construction site (C2). It is assumed that 100% of products are collected at the demolition site. A portion of recyclable materials such as glass, aluminum, steel, and stainless steel is sent directly to recycling facilities with specific recycling rates applied, while the remainder is sent to landfill. Losses in the sorting process are assumed to be very small and not considered in the assessment (C3-C4). Benefits of recycling waste generated in module A5 and C3 are taken into account in module D. The recycled steel and aluminium have been modelled to avoid use of primary materials. The scrap content in the studied product is considered and only the mass of primary steel in the product provides the benefit in order to avoid double counting. Wood waste is incinerated and the generated energy can replace the need for heat energy in district heating (D).

MANUFACTURING PROCESS

The windows and doors consists mainly in the following operations:
1. Aluminium profile preparation mainly via sawing, milling and gluing. Those aluminium profiles are powder coated, non-thermal break system and thermal break system.
2. Frame production by assembling the various profiles via corner connections and fixing via gluing and/or rimping. Connectors are composed of aluminium die cast.
3. Positioning and fixing the various gaskets.
4. The fittings integration (if relevant).
5. The fixing of the glazing unit via the glazing bead.

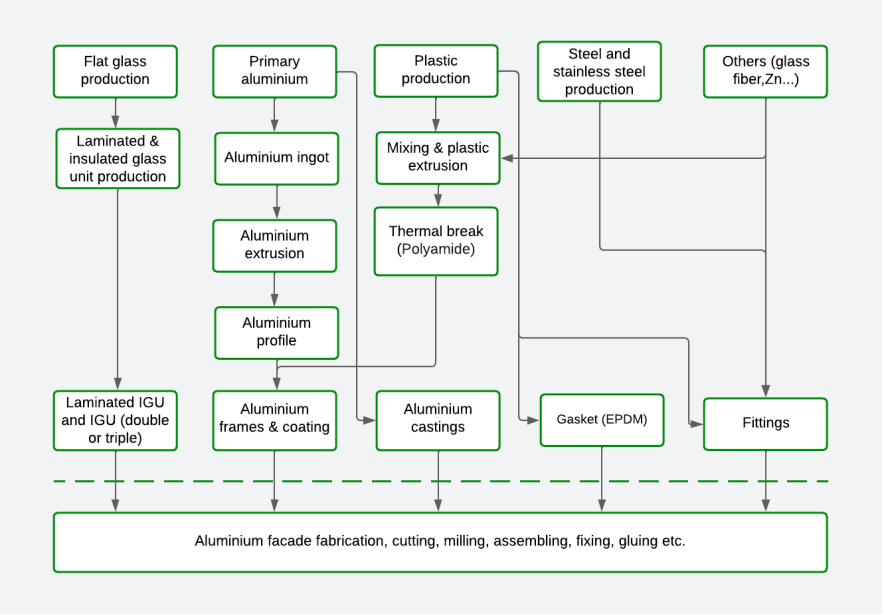


Figure 1. The process diagram.

LIFE-CYCLE ASSESSMENT

LIFE-CYCLE ASSESSMENT INFORMATION

Period for data	2023
Background data	Ecoinvent 3.8 (Allocation, cut-off, EN15804). EN 15804 reference package is based on EF 3.0
LCA software	OpenLCA software

DECLARED AND FUNCTIONAL UNIT

Declared unit	1 m2
Mass per declared unit	12.51 kg
Functional unit	-
Reference service life	50 years

SYSTEM BOUNDARY

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	D	D
x	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x	x	x
Geography, by two-letter ISO country code or regions. The International EPD System only.																		
VN	VN	VN	VN	VN	-	-	-	-	-	-	-	VN	VN	VN	VN	VN		
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.

DATA VARIABILITY

Supply-chain specific data for GWP-GHG	>90%
Variation in GWP-GHG(A1-A3)	+248%
Variation in Ozone depletion pot.	+100%
Variation in Acidification potential	+243%
Variation in EP-freshwater2)	+313%
Variation in EP-marine	+221%
Variation in EP-terrestrial	+196%
Variation in POCP (“smog”)3)	+172%
Variation in ADP-minerals & metals4)	+67%
Variation in ADP-fossil resources	+236%
Variation in Water use5)	+101%
Variation in GWP-GHG between sites	N/A

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 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.

All industrial processes from raw material acquisition and pre-processing, production, product distribution, installation, use of the product and end-of-life management are included. For easier modelling and because of lack of accuracy in available modelling resources some constituents under 0.1% of product mass are excluded. These include some substances which are present in the product only in very small amounts as they have no significant impact on the emissions. Further, water used for cleaning and

maintenance of the equipment, transportation and waste streams of the packaging materials used for delivering the raw materials to the factory are also included. The production of capital equipment, construction activities, and infrastructure, personnel-related activities, energy and water use related to company management and sales activities are excluded.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation.

In this study, as per EN 15804, allocation is conducted in the following order;

1. Allocation should be avoided.
2. Allocation should be based on physical properties (e.g. mass, volume) when the difference in revenue is small.
3. Allocation should be based on economic values.

In this study allocation could not be avoided for some packaging materials, ancillary material, energy consumption and waste production as the information was only measured on factory or production process level. The inputs were allocated to studied product based on annual production volume (mass allocation) and converted to the DU of 1 m2.
+ALUMINIUM PROFILE is converted from length to weight based on the manufacturer's provided information.
For example: Code 2200011751 with specifications of 3170kg/1000m. Using 267.01m, The weight of ALUMINIUM PROFILE used is 267.01 * 3.17 equal to 846.41536.
+GLASS with a thickness of 1mm, an area of 1m2 has a weight of 2.5kg.
Steel is converted based on width, length, thickness, and the specific weight of the steel to convert the weight.
For example: Code 2400001840 Steel box size 2, 40*40*6000(mm), specific weight of Steel is 7850 kg/m3, the weight of steel for this code is 2*40*4*6000*7850*10^-9 equal to 15.072 (kg).
This LCA study is conducted in accordance with all methodological considerations, such as performance, system boundaries, data quality, allocation procedures, and decision rules to evaluate inputs and outputs. Allocation used in Ecoinvent 3.8 environmental data sources follow the methodology ‘allocation, cut-off by classification’. This methodology is in line with the requirements of ISO 14025, ISO 14044 and the PCR. All estimations and assumptions regarding the cut off criteria and the allocation are declared in the part “Cut-off Criteria except the estimations/assumptions below:- Module A2, A4 & C2: Vehicle capacity utilization volume factor is assumed to be 1 which means full load. It may vary but as the role of transportation emission in total results is small, the variety in load is assumed to be negligible. Empty returns are considered as in the ecoinvent datasets. - Module A4: Transportation does not cause losses as products are packaged properly. Also, volume capacity utilisation factor is assumed to be 1 for the nested packaged products. Additionally, transportation distances are based on a sales volume-based weighted average and a lorry is the assumed vehicle type used. - Module C1: To demolish the building at the end of its life cycle, assume 0.036 MJ/kg of the product - Module C2: Transportation distance to waste treatment facility is estimated as 100 km and the transportation method is assumed as lorry. - Module C3, C4, D: A portion of recyclable materials such as glass, aluminum, steel, and stainless steel is sent directly to recycling facilities (C3) with specific recycling rates applied, while the remainder is sent to landfill (C4). Losses in the sorting process are assumed to be very small and not considered in the assessment (C3-C4). Benefits of recycling waste generated in module A5 and C3 are taken into account in module D.

The allocations in the Ecoinvent 3.8 datasets used in this study follow the Ecoinvent system model ‘Allocation, cut-off, EN15804’.

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. Note: additional environmental impact data may be presented in annexes.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	7.16E+01	1.41E+00	5.03E+00	MND	MND	MND	MND	MND	MND	MND	4.14E-02	6.80E-01	5.79E-01	2.03E-02	-4.64E+01
GWP – fossil	kg CO_2e	7.62E+01	1.41E+00	3.27E-01	MND	MND	MND	MND	MND	MND	MND	4.14E-02	6.79E-01	5.79E-01	2.03E-02	-4.66E+01
GWP – biogenic	kg CO_2e	-4.70E+00	8.54E-05	4.70E+00	MND	MND	MND	MND	MND	MND	MND	6.35E-06	4.12E-05	0.00E+00	0.00E+00	1.60E-01
GWP – LULUC	kg CO_2e	6.11E-02	8.58E-04	2.08E-05	MND	MND	MND	MND	MND	MND	MND	4.02E-06	4.14E-04	4.13E-04	2.07E-06	-6.39E-03
Ozone depletion pot.	kg $CFC_{-11}e$	3.80E-06	2.80E-07	3.61E-09	MND	MND	MND	MND	MND	MND	MND	8.85E-09	1.35E-07	1.72E-08	4.03E-09	-1.48E-06
Acidification potential	mol H^+e	7.20E-01	4.25E-03	2.91E-03	MND	MND	MND	MND	MND	MND	MND	4.30E-04	2.05E-03	2.27E-03	2.02E-04	-4.40E-01
EP-freshwater[2)]	kg Pe	3.61E-02	1.42E-04	1.41E-04	MND	MND	MND	MND	MND	MND	MND	1.30E-06	6.84E-05	1.55E-04	1.06E-06	-2.66E-02
EP-marine	kg Ne	1.01E-01	7.98E-04	3.65E-04	MND	MND	MND	MND	MND	MND	MND	1.91E-04	3.85E-04	3.10E-04	8.68E-05	-5.77E-02
EP-terrestrial	mol Ne	1.10E+00	8.63E-03	3.77E-03	MND	MND	MND	MND	MND	MND	MND	2.09E-03	4.17E-03	3.43E-03	9.50E-04	-5.84E-01
POCP ("smog")[3)]	kg NMVOCe	3.35E-01	3.13E-03	1.03E-03	MND	MND	MND	MND	MND	MND	MND	5.68E-04	1.51E-03	9.68E-04	2.59E-04	-1.60E-01
ADP-minerals & metals[4)]	kg Sbe	4.27E-04	8.01E-06	4.08E-07	MND	MND	MND	MND	MND	MND	MND	1.93E-08	3.87E-06	2.44E-05	9.45E-09	-5.87E-05
ADP-fossil resources	MJ	1.08E+03	2.09E+01	4.13E+00	MND	MND	MND	MND	MND	MND	MND	5.65E-01	1.01E+01	4.06E+00	2.72E-01	-6.40E+02
Water use[5)]	m^3e depr.	1.49E+01	1.22E-01	3.16E-02	MND	MND	MND	MND	MND	MND	MND	1.39E-03	5.89E-02	9.09E-02	6.92E-04	-4.63E+00

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	4.31E-06	6.78E-08	3.47E-09	MND	MND	MND	MND	MND	MND	MND	1.14E-08	3.27E-08	3.26E-08	5.26E-09	-2.48E-06
Ionizing radiation[6)]	kBq U235e	4.17E+00	9.23E-02	9.09E-04	MND	MND	MND	MND	MND	MND	MND	2.56E-03	4.46E-02	1.71E-02	1.18E-03	-2.73E+00
Ecotoxicity (freshwater)	CTUe	8.40E+00	4.72E-01	1.41E-02	MND	MND	MND	MND	MND	MND	MND	3.11E-03	2.28E-01	5.16E-01	1.46E-03	-2.35E+00
Human toxicity, cancer	CTUh	5.18E-08	6.09E-10	2.33E-11	MND	MND	MND	MND	MND	MND	MND	1.07E-11	2.94E-10	3.52E-10	5.40E-12	-3.24E-08
Human tox. non-cancer	CTUh	6.04E-06	3.64E-08	-2.07E-09	MND	MND	MND	MND	MND	MND	MND	1.70E-10	1.76E-08	5.28E-08	9.88E-11	-4.65E-06
SQP[7)]	-	1.48E+02	1.06E+01	4.75E-01	MND	MND	MND	MND	MND	MND	MND	1.49E-02	5.11E+00	1.01E+00	7.61E-01	-7.01E+01

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[8)]	MJ	1.18E+02	2.25E-01	8.68E-01	MND	MND	MND	MND	MND	MND	MND	2.46E-03	1.08E-01	2.25E-01	1.27E-03	-5.19E+00
Renew. PER as material	MJ	4.12E+01	1.04E-01	-2.16E+01	MND	MND	MND	MND	MND	MND	MND	7.20E-04	5.00E-02	2.23E-01	9.36E-04	-1.08E+01
Total use of renew. PER	MJ	1.59E+02	3.28E-01	-2.08E+01	MND	MND	MND	MND	MND	MND	MND	3.18E-03	1.58E-01	4.48E-01	2.20E-03	-1.60E+01
Non-re. PER as energy	MJ	7.94E+02	3.50E+00	4.05E+00	MND	MND	MND	MND	MND	MND	MND	3.16E-02	1.69E+00	2.16E+00	2.85E-02	-5.63E+02
Non-re. PER as material	MJ	2.87E+02	1.74E+01	7.21E-02	MND	MND	MND	MND	MND	MND	MND	5.33E-01	8.40E+00	1.90E+00	2.43E-01	-7.77E+01
Total use of non-re. PER	MJ	1.08E+03	2.09E+01	4.13E+00	MND	MND	MND	MND	MND	MND	MND	5.65E-01	1.01E+01	4.06E+00	2.72E-01	-6.40E+02
Secondary materials	kg	1.09E+00	1.95E-02	2.67E-01	MND	MND	MND	MND	MND	MND	MND	4.17E-04	9.40E-03	5.51E+00	2.08E-04	4.97E+00
Renew. secondary fuels	MJ	2.23E-01	2.28E-03	8.16E-05	MND	MND	MND	MND	MND	MND	MND	3.98E-05	1.10E-03	1.22E-03	2.67E-05	-3.80E-02
Non-ren. secondary fuels	MJ	8.52E-01	5.12E-03	1.40E-03	MND	MND	MND	MND	MND	MND	MND	6.36E-05	2.47E-03	7.82E-03	3.34E-05	-4.34E-01
Use of net fresh water	m^3	3.57E-01	3.01E-03	7.86E-04	MND	MND	MND	MND	MND	MND	MND	3.29E-05	1.46E-03	2.16E-03	1.66E-05	-1.14E-01

8) PER = Primary energy resources

END OF LIFE – WASTE

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	1.76E+02	7.45E-01	7.05E-01	MND	MND	MND	MND	MND	MND	MND	6.12E-03	3.60E-01	1.04E+00	5.09E-03	-1.26E+02
Non-hazardous waste	kg	6.14E+00	6.31E-01	4.94E-01	MND	MND	MND	MND	MND	MND	MND	4.18E-04	3.05E-01	4.27E-01	2.23E-04	-3.60E+00
Radioactive waste	kg	3.72E-02	3.20E-04	5.57E-06	MND	MND	MND	MND	MND	MND	MND	6.50E-06	1.55E-04	1.44E-04	3.09E-06	-2.53E-02

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	3.10E-18	2.09E-20	5.44E-20	MND	MND	MND	MND	MND	MND	MND	2.45E-22	1.01E-20	7.70E-21	-3.23E-23	-1.75E-18
Materials for recycling	kg	5.18E-01	1.48E-02	2.69E-04	MND	MND	MND	MND	MND	MND	MND	2.61E-04	7.14E-03	4.97E+00	1.34E-04	-1.21E-01
Materials for energy rec	kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	1.08E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ENVIRONMENTAL IMPACTS – GWP-GHG - THE INTERNATIONAL EPD SYSTEM

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG[10)]	kg CO_2e	7.63E+01	1.41E+00	3.27E-01	MND	MND	MND	MND	MND	MND	MND	4.14E-02	6.80E-01	5.79E-01	2.03E-02	-4.66E+01

10) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013). In addition, the characterisation factors for the flows - CH4 fossil, CH4 biogenic and Dinitrogen monoxide - were updated in line with the guidance of IES PCR 2019:14 Construction products, version 1.3.4 Annex 1. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterization factor for biogenic CO2 is set to zero.

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter		Value
Grid electricity (*)	Electricity data source and quality	Ecoinvent 3.8: electricity, medium voltage (market for electricity, medium voltage | electricity, medium voltage | EN15804) (Vietnam)
	Electricity kg CO_2e / kWh	0.562
Company-owned rooftop solar	Electricity data source and quality	Ecoinvent 3.8: electricity production, photovoltaic, 3kWp flat-roof installation,multi-Si - RoW - electricity, low voltage (Vietnam)
	Electricity kg CO_2e / kWh	0.0713
District heating data source and quality		NA
District heating CO_2e / kWh		NA

(*) Vietnam doesn't calculate the residual mix like the EU and doesn't have a Guarantees of Origin system. Therefore, it's not possible to subtract renewables from the consumption mix, and the residual mix is the same as the consumption mix.

Transport scenario documentation (A4)

Scenario parameter	Value
Specific transport CO_2e emissions, kg CO_2e / tkm	0.545
Average transport distance, km	194km
Capacity utilization (including empty return) %	100%
Volume capacity utilization factor	1

Installation scenario documentation (A5)

Scenario parameter	Value
Average electricity used during installation of 1m2 of product, kWh For products that are Solid panels, average electricity used during installation of 1m2 of product. kWh 0.2936445	0.587
Electricity kg CO_2e / kWh	0.562

End of life scenario documentation

Scenario parameter		Value
Energy to demolish the building at the end of its life cycle, MJ/kg		0.036
Specific transport CO_2e emissions, kg CO_2e / tkm		0.545
Average transportation distance for end-of-life waste disposal, km		100
Capacity utilization (including empty return) %		100%
Volume capacity utilization factor		1
Mass ratio of end-of-life waste processing: Recycling % (C3) and Landfill % (C4)	Glass	30:70
	Aluminium	95:5
	Steel	95:5
	Stainless Steel	95:5
	PP Plastic	0:100
	Rubber	0:100
	Silicone	0:100

	Rockwool	0:100
Collection process specified by type	kg collected separately	4.97
	kg mixed construction waste	7.54
Recovery system specified by	kg for re-use	0
	kg for recycling	4.97
	kg for energy recovery	0
Disposal specified by type	kg product or material for final deposition	7.54

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