GLOBAL GREEN TAG INTERNATIONAL PTY LTD Level 34/26 Eagle St, Brisbane, QLD, 4000, Australia

EPD™

Environmental Product Declaration

in accordance with ISO 14025 and EN 15804+A2

Fairview

Vitradual

Company Address:	18-20 Donald St, Lithgow, NSW 2790
Issue Date:	22 November 2023
Valid to:	22 November 2028
Document Version:	1.2
Revision Date:	01 August 2024

ECO PLATFORM

ECO PLATFORM EPD VERIFIED

FAIRVIEW™

DEFINING ARCHITECTURE SINCE 1963

Environment Product Declaration Details

EPD Scope	Cradle to Gate with Options
EPD Type	Product Specific EPD
EPD Number	FAI:VD01:2023:EP
Issue Date	22 November 2023
Valid Until	22 November 2028

CEN standard EN 15804 serves as the core PCR

Compliant with EN 15804:2012+A2:2019

Independent external verification of the declaration and data, according to ISO 14025:2010

☐Internal ☒External

Third Party Verifier	Angel Avadi, 4A Klima
Internal EPD Review	Nana Bortsie-Aryee, Global GreenTag Pty Ltd

The EPD is property of declared manufacturer. Different program EPDs may not be comparable as e.g. Australian transport is often more than elsewhere. Comparability is further dependent on the product category rules used and the source of the data. EPDs of construction products may not be comparable if they do not comply with EN15804. Further explanatory information is found at globalgreentag.com or contact: epd@globalgreentag.com.

This Environmental Product Declaration (EPD) discloses potential environmental outcomes compliant with EN 15804:2012 +A2 2019 for business to business communication and currency as per Section 7.1 Table 2.

EPD Program Operator	EPD Producer	Declaration Owner
Global GreenTag International Pty Ltd PO Box 311 Level 38, 71 Eagle Street Brisbane City QLD 4000 Australia Phone: +61 1300 263 586 http://www.globalgreentag.com	IKE Environmental Technology Co. Ltd. PO Box 610000 No.139 Kehua Middle Road, Wuhou District Phone: +86 13882120195 http://www.ike-global.com	FVA Group Pty Ltd (Fairview) 18-20 Donald St, Lithgow, NSW 2790 Phone:+61 1800 007 175 http://www.fv.com.au

Product Information

Product Name	Vitradual
Description	Pre-finished solid aluminium panel, Vitradual features a durable PVDF resin-based coating or finish, known for its high durability and optimum resistance to weather and industrial pollution.
PCR	CEN standard EN 15804 serves as the core PCR
Declared Unit/ Functional Unit	The function unit is 1 m^2 of Vitradual with an average weight of 8.1kg/m^2 and 8.6kg/m^2 from cradle to Gate with options，modules A4-A5,C1-C4 and module D
Manufacturer	20 years
Manufacturing Site	Chuzhou City, Anhui Province Huashi Town,Jiangyin,Jiangus,CHINA
Site Representation	Australasia
Cut-off criteria & Data quality	Complies with EN 15804+A2:2019
Standards	This product complies with ISO 14044: 2006 EM: LCA: Requirement & guideline for data review: LCI; LCIA, Interpretation results: Include addition quality testing as required by PCR.

Product Specifications

Test	Result
AS 1530.1 - Combustibility Test for materials	Not deemed combustible
4 Point Bending at Third Points	Available on request
AS1530.3 - Fire Test on Building Materials	Ignitability index : 0, Spread of Flame Index: 0, Heat Evolved Index: 0, Smoke Developed Index:1
ANSI FM 4473 Test Standard for Impact Resistance Testing of Rigid Roofing Materials	Available on request
AS1734:1997 Tensile Strength	Pass
AAMA2605-17 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminium Extrusions and Panels	Pass
AS 5637.1 Clause 9(n) NCC group number	Group Number 1
AS/NZA 4284:2008 Testing of building facades clause 8.2,8.3,8.5,8.6,8.8	Compliant for rigid and Flexible Membranes
Code Mark (BCA) 2022 Conformity	Compliant (see certificate for limitations)

Restricted Substance List

N/A

Functional & Technical Performance

Industrial, commercial and residential building in/exterior

Range and variability

Significant differences of average LCIA results are declared

Primary Data

Data was collected in accordance with EN ISO 14044:2006, 4.3.2, from primary sources including factory audits, suppliers and their publications on corporate locations, logistics, technology, market share, management system, standards and commitment to improved environmental performance.

Substances of Very High Concern

Contains no substances in the “Candidate List of Substances of Very High Concern for authorisation” registration with the European Chemicals Agency

Manufacturing Process

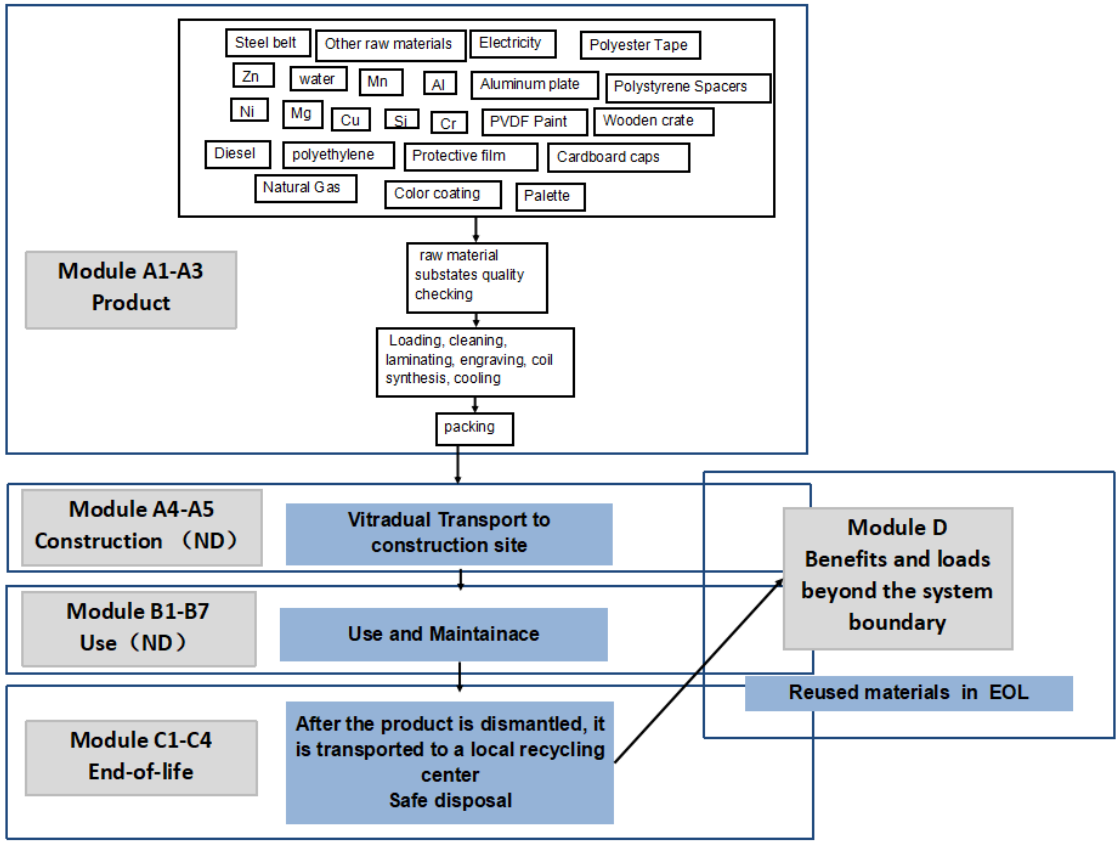

Figure 1. Vitradual Products Cradle to Gate System Boundary

Base Material Origin and Detail

Table 1 lists key components and additives by function, type, key operation, source and amount.

Table 1 Base Material

Product	Component	Material	Source	% mass
Vitradual manufactured in Anhui, China	3mm Aluminium Panel	Aluminium	China	>95%
	PVDF Paint	Polyvinylidene Fluoride	China	<1%
Vitradual manufactured in Jiangsu, China	3mm Aluminium Panel	Aluminium	China	>95%
	Colour Coating	Resin	USA	<1%
	Protective Film	Polyethylene	China	<1%

Mass Balance

According to Table 2, products produced in the Anhui in China and Jiangsu in China are mass-balanced.

Table 2 The mass balance of the 1 m2 Vitradual

Vitradual Manufactured in Anhui, China		
Inputs	Name	Weight（kg）
	3mm Aluminium Panel	8.06
	PVDF Paint	0.08
Outputs	Vitradual	8.1
Vitradual Manufactured in Jiangsu, China		
Inputs	Name	Weight（kg）
	3mm Aluminium Panel	8.55
	Colour coating	0.04
	Protective film	0.00903
Outputs	Vitradual	8.6
	Castoff	0.13

Greenhouse Gas Emissions and Fossil Fuel Inputs

Table 3 Greenhouse Gas Emissions and Fossil Fuel Inputs for 1 m^2 Vitradual

Fossil Fuel	Usage	Emission factors			Emission factor sources
		CO_2	CH_4	N_2O	
Vitradual manufactured in Anhui,China					
Natural Gas	5.16 m^3	2.09 CO_2kg/M^3	3.73E-05 CH_4kg/M^3	3.73E-06 N_2Okg/M^3	IPCC
Vitradual manufactured in Jiangsu, China					
Diesel	0.14L	2.73 CO_2kg/L	1.44E-04 CH_4kg/L	1.44E-04 N_2Okg/L	IPCC
Natural Gas	4.77m^3	2.09 CO_2kg/M^3	3.73E-05 CH_4kg/M^3	3.73E-06 N_2Okg/M^3	IPCC

Program Description

EPD Scope	Cradle to gate (A1 to A3,C1-C4 and D) as defined by EN 15804+A2 and depicted in Figure 1
System Boundary	The system boundary with nature included processing material and energy system inputs, manufacture and transport to factory gate plus waste arising.
Reference Service Life	20 years[1]
Comparability	Construction product EPDs may not be comparable if not EN15804 compliant
EPD Stages Considered	A1-A3,C1-C4,D
Product Stages Included	A1 Raw material supply • Raw material acquisition, extraction, refining and processing • Secondary material acquisition and processing • Reuse of scrap product or material from a previous product system • Electricity generated from all sources with extraction, refining & transport • Secondary fuel energy and recovery processes A2 Transport internal and to the factory gate A3 Manufacture of product co-products and packaging plus • Production of inputs and ancillary material • System flows leaving at end-of-waste boundary allocated as coproducts C1 Deconstruction demolition C2, transport to waste processing C3, waste processing for reuse, recovery and/or recycling C4, disposal D, reuse, recovery and/or recycling potentials, expressed as net impacts and benefits.
Cut Off Criteria	In this study, the "PVDF Paint"，" Vinyl Sealer Tape 0 PVC" and "PET Packer" used in the production process were ignored because it accounted for less than 1%, and the rest of the raw materials and energy consumption were taken into account. The sum of the neglected processes over their entire life cycle does not exceed 5% of energy use and quality. The manufacturer provides transport expenditure data for all relevant material flows. Excluding machines and facilities required in the production process.
Stages Excluded	A4-5, B1-7
Data Collection Year	2021
Background Data	Table 4、Table 5

[1] The reference service life was determined by the manufacturer's extended warranty.

Allocations Method	According to ISO 14044/44, allocation is needed in several situations for LCA. One of those is recycling of end-of-life materials. Therefore, a reasonable recycling method is needed to calculate the environmental benefits of the reprocessed materials at EoL stage. This study will quote "Allocation 50/50 method". Allocation 50/50 is the most common recycling methods, which has been discussed and accepted by PEF guide It "allocates the impacts and benefits due to recycling equally between the producer using recycled material and the producer producing a recycled product" [Product Environmental Footprint (PEF) Guide,2013].
Scenario Modelling Assumption	Stage C - end of life: it is assumed that the product is disposed of by landfilling which require no waste processing and transport distance of product to landfill site is 100km. Stage D – benefits and loads beyond the system boundary: includes reuse, recovery and/or recycling, and transport to recycling operations. We assume aluminium recycle content and transport distance to recycle site is 100km.
Product Average	Table 8

Background Data

Table 4. Data sources for the Vitradual （Anhui, China）

Component	Material Description	Material Dataset	Data Source	Publication Date
Vitradual Product Component				
3mm Aluminium Panel	Aluminium	Aluminium Strip - Aluminium Strip (Cast & Rolled) (China)	CLCD- 0.8	2013
Packing				
Steel Strapping	Steel	Hot Rolled Strip (t Unclassified), Industry LCA - Represents Specific Technology/Industry-wide/Market Average (for Process Industry Database and Technical Research), China, 2020, From Cradle to Gate (From Resource Extraction to Product Delivery)	CLCD- 0.9	2020
Wooden Crate	Wood	Spruce wood-Spruce wood(Germany)	ELCD3.0	2012
Transportation				

Road Transport-3mm Aluminium Panel/ PVDF Paint	Diesel Truck	Heavy Diesel Trucking (10t) (t*km Heavy Goods Vehicle), Industry LCA - Represents Specific Technology/Industry-wide/Market Average (for Process Industry Database and Technology Research), China, 2020, From cradle to gate (from resource extraction to product delivery)	CLCD- 0.9	2020
Energy				
Grid Electricity	Grid Electricity-Product	Average grid electricity in China	CLCD- 0.9	2021
Natural Gas	Natural Gas	Natural Gas (National Average) (M3 Unclassified), Industry LCA - Represents Specific Technology/Industry-wide / Market Average (for Process Industry Database and Technology Research), China, 2020, Cradle to Gate (From Resource Extraction to Product Delivery)	CLCD- 0.9	2020
Water	Tap Water	Tap Water (t Not Classified), Industry LCA - Represents Specific Technology/Industry-wide/Market Average (for Process Industry Database and Technology Research), China, 2020, From Cradle to Gate (From Resource Extraction to Product Delivery)	CLCD- 0.9	2020
Waste Treatment				
Waste Disposal	Landfill	Treatment of inert waste, sanitary landfill	Ecoinvent 3.8	2021

Table 5. Data sources for the Vitradual Jiangsu,China）

Component	Material Description	Material Dataset	Data Source	Publication Date
Vitradual Product Component				
3mm Aluminium Panel	Aluminium	Aluminium Strip - Aluminium Strip (Cast & Rolled) (China)	CLCD- 0.8	2013
Protective Film	Polyethylene	Fleece production, polyethylene	Ecoinvent 3.8	2021
Colour Coating	Resin	Coating powder production	Ecoinvent 3.8	2021
Packing				
Palette	Polyethylene	Fleece production, polyethylene	Ecoinvent 3.8	2021
Paper Wrapping	Plastic wrapping	Extrusion, plastic film	Ecoinvent 3.8	2021
Cardboard Tube Core/Cardboard Caps	Cardboard	Corrugated Board(t n.g.), Industry LCA - Represents Specific Technology/Industry-wide/Market Average (for	CLCD- 0.9	2020

		Process Industry Database and Technology Research), China, 2020, From cradle to gate (from resource extraction to product delivery)		
Paper Masking & Sealing Tape/ Paper Roll Labels	PET	Polyethylene terephthalate, granulate, amorphous, recycled to generic market for amorphous PET granulate	Ecoinvent 3.8	2021
Steel Strapping	Steel	Hot Rolled Strip (t Unclassified), Industry LCA - Represents Specific Technology/Industry-wide/Market Average (for Process Industry Database and Technical Research), China, 2020, From Cradle to Gate (From Resource Extraction to Product Delivery)	CLCD- 0.9	2020
Wooden Crate	Wood	Spruce wood-Spruce wood (Germany)	ELCD3.0	2012
Polyester Tape	Polyester	Market for fibre, polyester	Ecoinvent 3.8	2022
Polystyrene Spacers	Polystyrene	Polystyrene production, expandable	Ecoinvent 3.8	2021
Transportation				
Road Transport-3mm Aluminium Panel/Protective Film/Colour Coating	Diesel Truck	Heavy Diesel Trucking (10t) (t*km Heavy Goods Vehicle), Industry LCA - Represents Specific Technology/Industry-wide/Market Average (for Process Industry Database and Technology Research), China, 2020, From cradle to gate (from resource extraction to product delivery)	CLCD- 0.9	2020
Energy				
Grid Electricity	Grid Electricity-Product	Average grid electricity in China	CLCD- 0.9	2021
Diesel	Diesel Oil	Diesel (market average)	CLCD- 0.9	2021
Natural Gas	Natural Gas	Natural Gas (National Average) (M3 Unclassified), Industry LCA - Represents Specific Technology/Industry-wide / Market Average (for Process Industry Database and Technology Research), China, 2020, Cradle to Gate (From Resource Extraction to Product Delivery)	CLCD- 0.9	2020
Water	Tap Water	Tap Water (t Not Classified), Industry LCA - Represents Specific Technology/Industry-wide/Market Average (for Process Industry Database and Technology Research), China, 2020, From Cradle to Gate (From Resource Extraction to Product Delivery)	CLCD- 0.9	2020

Waste Treatment				
Packaging Waste	Landfill	Treatment of inert waste, sanitary landfill	Ecoinvent 3.8	2021
Hazardous Waste	Incineration	Treatment of hazardous waste, hazardous waste incineration	Ecoinvent 3.8	2021
Sewage	Dispose	Market for wastewater, average	Ecoinvent 3.8	2021

Data Quality Assessment

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.

Table 6. Data quality assessment for the Vitradual product system

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 3 years old (typically 2020 and 2021). All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on annualized production for 2021.
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 provides the best representation of the current data. Electricity consumption for product manufacturing was modeled using representative data from Saudi Arabia. The surrogate data used in the assessment is representative of business globally or in other parts of the world. Data representing operations in the rest of the world is considered similar enough to actual processes. Data representing product disposition is based on regional statistics.
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 fabrication 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	Data collected for operations were typically averaged for one or 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 electrical cables and accessories products. 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. Different portions of the product life cycle are equally considered; however, it must be noted that final disposition of the product is based on assumptions of current practices in Australian
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 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 China Factories represent an annual average and are considered of high quality due to the length of time over which these data are collected. For secondary LCI datasets, CLCD 0.8 and 0.9, Ecoinvent v3.8,ELCD v3.0 LCI data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the Vitradual 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).

LCA Scenarios and Additional Technical Information

EoL stage (C1 - C4, D)

The disposal stage includes demolition of the products (C1); transport of the Vitradual to waste treatment facilities (C2); waste processing (C3); and associated emissions as the product degrades in a landfill (C4). For the Vitradual, no emissions are generated during demolition (C1) while no waste processing (C3) is required for underground deposit. After demolition, non-recyclable waste is disposed of in landfills(C4), and the landfill process is connected to the Ecoinvent database.

Transportation of waste materials at end-of-life (C2) assumes a 100 km average distance to disposal. Aluminium materials in the product are assumed at end-of-life.

The data for waste transportation of per t*km are obtained from Ecoinvent 3.8. The functional unit was defined as diesel trucks completing 1t*km on the suburbs highway with 7.5~16 ton load capacity .

Data from the landfill comes from Ecoinvent 3.8. It represents the treatment of waste, including foundation sealing, leachate collection systems, leachate wastewater treatment plants.

Table 7. EoL parameters for Vitradual products, per 1 m^2

Processes	Unit	Vitradual (Anhui,China)	Vitradual (Jiangsu,China）
Collection Process	kg: collected separately	8.1	8.6
Recovery System	kg: for recycling	7.938	8.428
Safe Disposal	kg: for final disposal	1.62	1.72
Transportation	km	100	100

Product Average

The environmental impact category indicators are also reported based on the EFv3.1 characterisation factors according to EN15804.

Table 8 LCA impact indicators

Core environmental impact indicators		
Impact category	**Indicator**	**Unit**
Climate change – fossil	GWP-fossil	kg CO2 eq
Climate change – biogenic	GWP-biogenic	kg CO2 eq
Climate change - land use and land use change	GWP-luluc	kg CO2 eq
Climate change – total	GWP-total	kg CO2 eq
Ozone Depletion	ODP	kg CFC 11 eq.
Acidification	AP	mol H+ eq.
Depletion of abiotic resources -fossil fuels	ADP-fossil	MJ, net calorific value
Eutrophication aquatic freshwater	EP-freshwater	kg P eq.
Eutrophication aquatic marine	EP-marine	kg N eq.
Eutrophication terrestrial	EP-terrestrial	mol N eq
Photochemical ozone formation	POCP	kg NMVOC eq.
Depletion of abiotic resources -minerals and metals	ADP-minerals&metals	kg Sb eq.
Depletion of abiotic resources -fossil fuels	ADP- fossil	kg Sb eq.
Water use[2]	WDP	m3 world eq

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

Additional environmental impact indicators		
Impact category	**Indicator**	**Unit**
Particulate Matter emissions	PM	Disease incidence
Ionizing radiation, human health	IRP	kBq U235 eq
Eco-toxicity (freshwater)	ETP-fw	CTUe
Human toxicity, cancer effects	HTP-c	CTUh
Human toxicity, non-cancer effects	HTP-nc	CTUh
Land use related impacts/ Soil quality	SQP	dimensionless

Results of the Life Cycle Assessment are presented below.

Table 9. Cradle to Gate LCA results for 1m^2 Vitradual

Core environmental impact indicators-1						
Product/LCIA Impact	GWP-total	GWP-Fossil	GWP-Biogenic	GWP-Land use	ODP	AP
Vitradual (Anhui,China)	1.70E+02	1.61E+02	6.87E-01	0.00E+00	1.65E-06	1.05E+00
Vitradual（Jiangsu,China）	1.75E+02	1.65E+02	1.21E+00	0.00E+00	1.78E-06	1.10E+00
Core environmental impact indicators-2						
Product/LCIA Impact	EP Fresh water	EP terrestrial	EP-marine	POCP	ADP fossil	ADP-mineral and metal
Vitradual (Anhui,China)	1.96E-03	1.86E+00	1.67E-01	5.07E-01	2.26E+03	2.01E-05
Vitradual（Jiangsu,China）	2.11E-03	1.93E+00	1.74E-01	5.32E-01	2.26E+03	2.49E-05

Additional environmental impact indicators						
Product/LCIA Impact	PM	IRP	ET freshwater	HT cancer	HT-non cancer	SQP
Vitradual (Anhui,China)	ND	2.88E+00	2.44E+04	-4.44E-06	-1.07E-03	ND
Vitradual（Jiangsu,China）	ND	2.85E+00	2.59E+04	-6.07E-06	-1.29E-03	ND

Information Modules

The LCA and EPD declare results for mandatory A1-A3,C1-C4 and D information modules as shown in Figure 2. Optional modules and stages A3-A4,B1-B7 are excluded and are marked Not Declared (ND). ND does not indicate zero inventory or impact results

	Product			Construction		Use stage of building fabric and operation							End of life stage				Resource recovery stage
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Modules	✓	✓	✓	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	✓	✓	✓	✓	✓
Modelling	**Actual**			**Scenarios**													**Optional**

ND = Module not declared ✓= included

Figure 2 Phases and Stages Cradle to Gate

The description of life cycle stage A-D are as follows:

A1 Extraction and processing of raw materials for the Vitradual products components.

A2 Transport of component materials to the manufacturing facilities

A3 Manufacturing of Vitradual products and packaging

A4 Transport of product (including packaging) to the building site（ND）

A5 Install the product（ND）

B1 Use of the Vitradual products in a building setting（ND）

B2 Maintenance of the usage phase（ND）

B3-B5 Repairing, replacing and refurbishing during the use phase (ND)

B6 Energy use during the use phase (ND)

B7 Water use during the use phase (ND)

C1 Demolition of the products is accomplished using hand tools with no associated emissions and negligible impacts

C2 Transport of Vitradual products to local recycling centre at end-of-life

C3 The products is disposed of by using hand tools manually strip the metal material from it which require no waste processing

C4 Disposal of Vitradual products for underground deposit

D Recyclable metal from C3

Material Flow Diagram

In the process of producing Vitradual, some waste (such as: plastic waste, metal waste) will be generated, these scraps will be sold as by-products after processing, and the production of 8.6kg Vitradual will produce 0kg~0.01kg by-products, so the environmental impact is distributed according to the weight of the main by-products, main products: 99.88%~100%, by-products: 0%~0.12%.

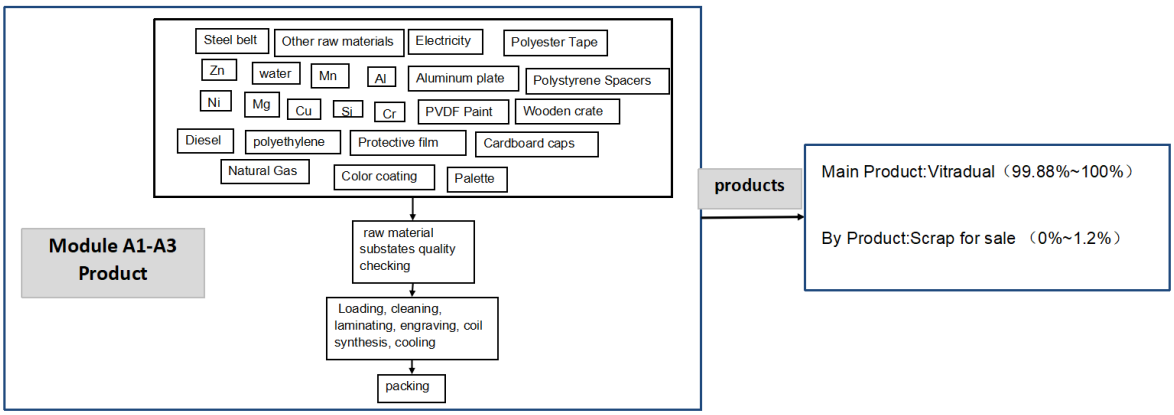

Figure 3 Material Flow Diagram

Cradle to Gate + Options Inventory

Table 10 Inventory Resource Use Results/1 m^2 Vitradual（Anhui,China）[3]

Stages		Product			End of life stage				Resource recovery stage
		A1	A2	A3	C1	C2	C3	C4	D
Module Codes[4]	Unit	Raw material supply	Transport	Manufacturing	De-construction demolition	Transport	Waste processing	Disposal	Recycling
GWP-fossil	kg CO2 eq	1.90E+02	1.86E+00	1.11E+01	0.00E+00	4.30E-01	1.31E-01	0.00E+00	-4.20E+01
GWP-biogenic	kg CO2 eq	2.10E-01	3.49E-03	3.05E-03	0.00E+00	1.10E-02	4.89E-01	0.00E+00	-3.00E-02
GWP-luluc	kg CO2 eq	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP-total	kg CO2 eq	1.98E+02	1.86E+00	1.11E+01	0.00E+00	4.40E-01	5.35E-01	0.00E+00	-4.21E+01
ODP	kg CFC 11 eq.	1.97E-06	8.12E-11	2.98E-09	0.00E+00	9.09E-08	2.67E-09	0.00E+00	-4.20E-07
AP	mol H+ eq.	1.10E+00	1.12E-02	4.45E-04	0.00E+00	2.78E-03	1.07E-04	0.00E+00	-6.66E-02
ADP-fossil	MJ, net calorific value	2.74E+03	3.91E+01	6.32E-01	0.00E+00	7.07E+00	2.22E-01	0.00E+00	-5.31E+02
EP-freshwater	kg P eq.	2.01E-03	1.03E-07	8.94E-05	0.00E+00	4.45E-05	1.02E-05	0.00E+00	-1.94E-04
EP-marine	kg N eq.	1.75E-01	5.44E-03	1.64E-03	0.00E+00	1.00E-03	1.49E-03	0.00E+00	-1.77E-02
EP-terrestrial	mol N eq	1.94E+00	5.95E-02	1.27E-03	0.00E+00	1.10E-02	3.25E-04	0.00E+00	-1.57E-01
POCP	kg NMVOC eq.	5.27E-01	1.47E-02	1.81E-04	0.00E+00	2.99E-03	2.70E-04	0.00E+00	-3.84E-02
ADP-minerals&metals	kg Sb eq.	2.58E-05	4.33E-09	5.12E-07	0.00E+00	2.61E-06	5.14E-08	0.00E+00	-8.89E-06
ADP- fossil	kg Sb eq.	ND	ND	ND	ND	ND	ND	ND	ND
WDP	m3 world eq	3.98E+02	1.43E-02	8.22E+00	0.00E+00	1.79E+01	7.76E+00	0.00E+00	-1.50E+01

[3] Results are reported in scientific notation where 1.00E+01 is 10 and 1.00E-01 is 0.1
[4] See 'Table 5 LCA impact indicators' for full module names

Table 11 Inventory Resource Use Results/1 m^2 Vitradual (Jiangsu,China)

Stages		Product			End of life stage				Resource recovery stage
		A1	A2	A3	C1	C2	C3	C4	D
Module Codes	Unit	Raw material supply	Transport	Manufacturing	De-construction demolition	Transport	Waste processing	Disposal	Reuse, recovery ,Recycling
GWP-fossil	kg CFC 11 eq.	1.99E+02	2.59E-03	1.04E+01	0.00E+00	4.57E-01	2.68E-01	0.00E+00	-4.46E+01
GWP-biogenic	kg CO2 eq	2.24E-01	4.86E-06	1.79E-04	0.00E+00	1.16E-02	1.00E+00	0.00E+00	-3.18E-02
GWP-luluc	kg CO2 eq	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP-total	kg CO2 eq	2.08E+02	2.60E-03	1.04E+01	0.00E+00	4.67E-01	1.09E+00	0.00E+00	-4.47E+01
ODP	kg CFC 11 eq.	2.12E-06	1.13E-13	1.41E-09	0.00E+00	9.65E-08	5.47E-09	0.00E+00	-4.46E-07
AP	mol H+ eq.	1.17E+00	1.56E-05	2.65E-05	0.00E+00	2.95E-03	2.19E-04	0.00E+00	-7.07E-02
ADP-fossil	MJ, net calorific value	2.82E+03	5.45E-02	8.52E-02	0.00E+00	7.51E+00	4.54E-01	0.00E+00	-5.64E+02
EP-freshwater	kg P eq.	2.24E-03	1.44E-10	3.31E-06	0.00E+00	4.72E-05	2.10E-05	0.00E+00	-2.06E-04
EP-marine	kg N eq.	1.88E-01	7.58E-06	1.71E-05	0.00E+00	1.06E-03	3.06E-03	0.00E+00	-1.88E-02
EP-terrestrial	mol N eq	2.09E+00	8.30E-05	7.68E-05	0.00E+00	1.16E-02	6.66E-04	0.00E+00	-1.66E-01
POCP	kg NMVOC eq.	5.67E-01	2.05E-05	1.88E-03	0.00E+00	3.17E-03	5.52E-04	0.00E+00	-4.07E-02
ADP-minerals&metals	kg Sb eq.	3.14E-05	6.04E-12	2.42E-08	0.00E+00	2.77E-06	1.05E-07	0.00E+00	-9.44E-06
ADP- fossil	kg Sb eq.	ND	ND	ND	ND	ND	ND	ND	ND
WDP	m3 world eq	4.72E+02	2.00E-05	4.74E-01	0.00E+00	1.90E+01	1.59E+01	0.00E+00	-1.59E+01

Note Additional Environment Indicators are not declared in this EPD.

Table 12 Inventory Resource Use Results/1 m^2 Vitradual（Anhui,China）

		Product			End of life stage				Resource recovery stage
		A1	A2	A3	C1	C2	C3	C4	D
Module Codes	**Unit**	Raw material supply	Transport	Manufacturing	De-construction demolition	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling
Net Fresh Water Use	**m^3**	0.00E+00	0.00E+00	8.10E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary Material	**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
Secondary Renewable Fuel	**MJ ncv**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Renewable Material	**MJ ncv**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Energy Renewable Not Feedstock	**MJ ncv**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Energy Renewable Total	**MJ ncv**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary Non-renewable Fuel	**MJ ncv**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Energy Non-renewable Material	**MJ ncv**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Non-renewable Energy Not Feedstock	**MJ ncv**	0.00E+00	0.00E+00	1.87E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Energy Non-renewable Total	**MJ ncv**	0.00E+00	0.00E+00	1.87E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hazardous Waste Disposed	**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
Non-hazardous Waste Disposed	**kg**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-01	0.00E+00	0.00E+00
Radioactive Waste Disposed	**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
Components For Reuse	**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
Material For Recycling	**kg**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.94E+00
Material For Energy Recovery	**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
Exported Energy Electrical	**MJ ncv**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported Energy Thermal	**MJ ncv**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 12 Inventory Resource Use Results/1 m^2 Vitradual (Jiangsu,China)

		Product			End of life stage				Resource recovery stage
		A1	A2	A3	C1	C2	C3	C4	D
Module Codes	**Unit**	Raw material supply	Transport	Manufacturing	De-construction demolition	Transport	Waste processing	Disposal	Reuse, Recovery Recycling
Net Fresh Water Use	m^3	0.00E+00	0.00E+00	6.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary Material	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
Secondary Renewable Fuel	MJ $_{ncv}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Renewable Material	MJ $_{ncv}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Energy Renewable Not Feedstock	MJ $_{ncv}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Energy Renewable Total	MJ $_{ncv}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary Non-renewable Fuel	MJ $_{ncv}$	0.00E+00	0.00E+00	5.12E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Energy Non-renewable Material	MJ $_{ncv}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Non-renewable Energy Not Feedstock	MJ $_{ncv}$	0.00E+00	0.00E+00	1.70E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary Energy Non-renewable Total	MJ $_{ncv}$	0.00E+00	0.00E+00	1.70E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hazardous Waste Disposed	kg	0.00E+00	0.00E+00	3.44E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous Waste Disposed	kg	0.00E+00	0.00E+00	1.30E-01	0.00E+00	0.00E+00	1.72E+00	0.00E+00	0.00E+00
Radioactive Waste Disposed	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
Components For Reuse	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
Material For Recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.43E+00
Material For Energy Recovery	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
Exported Energy Electrical	MJ $_{ncv}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported Energy Thermal	MJ $_{ncv}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Interpretation

For given figures, the contribution of manufacturing stage to the LCIA results of all the Vitradual products are highest except for GWP-Biogenic. This is because the production process needs a lot of materials and energy. For the AP and EP , they have much to do with waste disposal in the waste stage.

In the EoL phase, the environmental impact is caused by the landfill.

In Module D, 98% of the scrap can be recycled, thus offsetting a significant environmental impact.

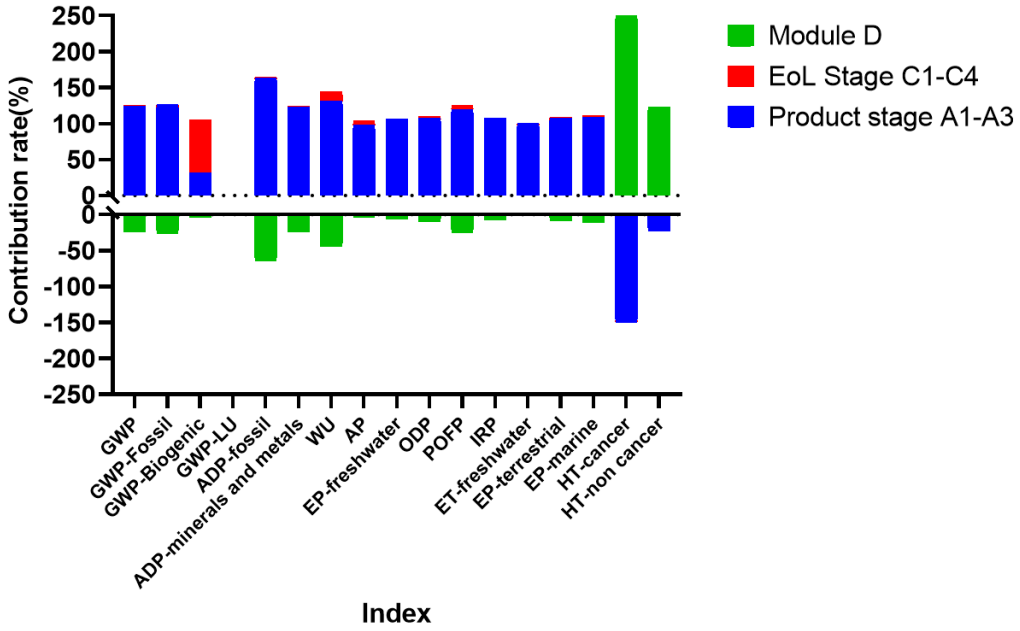

Fig 5. Vitradual(Anhui,China) product each stage contribution to LCA results

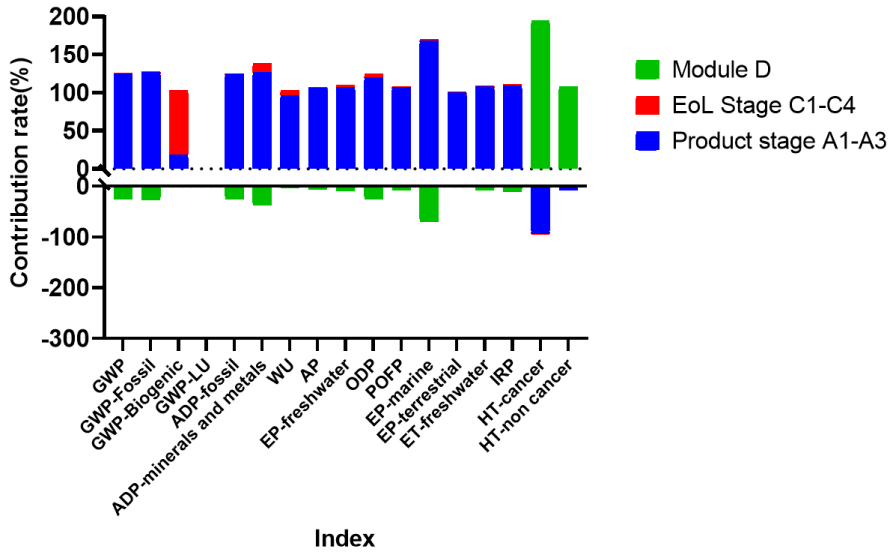

Fig 6. Vitradual(Jiangsu,China) product each stage contribution to LCA results

Sensitivity Analysis

From calculation results, it is seen that most of the environmental impact is caused by Module A1-A3. It can be seen from the result table that the use of raw aluminium coil, aluminium skin, aluminium panel increases the environmental impact of module A1-A3, because the production of aluminium will cause more environmental impact. Therefore, in the process of producing aluminium coils, using more recycled aluminium will reduce environmental emissions.

Aluminium plate linked to the CLCD database of aluminium plate produced with 100% primary aluminium.

The sensitivity analysis was carried out to understand the environmental impact of the aluminium strip produced from 20% recycled aluminium in the production of Vitradual, so the aluminium strip produced by 100% primary aluminium connected by aluminium coil, aluminium skin, aluminium plate was replaced with aluminium strip produced by 80% primary aluminium.

According to the results, it can be seen that the HT- cancer and HT-non cancer indicators have the greatest impact.

Table 12. Sensitivity analysis table

Product/ LCIA Impact	Core environmental impact indicators								
	GWP-total	GWP-Fossil	GWP-Biogenic	GWP-Land use	ODP	AP	EP-Fresh water	EP-terrestrial	EP-marine
1 Vitradual (Anhui, China) (Results without recycled aluminium)	1.70E+02	1.61E+02	6.87E-01	0.00E+00	1.65E-06	1.05E+00	1.96E-03	1.86E+00	1.67E-01
2 Vitradual (Anhui, China) (Results with recycled aluminium)	1.37E+02	1.36E+02	7.80E-01	0.00E+0	6.21E-07	1.03E-01	3.84E-04	2.87E-01	3.32E-02
Percentage of change	-19.67%	-15.55%	13.54%	0.00%	-62.39%	-90.15%	-80.42%	-10.21%	-81.38%
3 Vitradual (Jiangsu, China) (Results without recycled aluminium)	1.75E+02	1.65E+02	1.21E+00	0.00E+00	1.78E-06	1.10E+00	2.11E-03	1.93E+00	1.74E-01
4 Vitradual (Jiangsu, China) (Results with recycled aluminium)	1.40E+02	1.38E+02	1.30E+00	0.00E+00	6.86E-07	1.04E-01	4.39E-04	2.74E-01	3.23E-02
Percentage of change	-20.25%	-16.07%	8.17%	0.00%	-61.39%	-90.56%	-79.21%	-85.86%	-98.48%

Product/LCIA Impact	Core environmental impact indicators				Additional environmental impact indicators					
	POCP	ADP-fossil	ADP-mineral and metal	WU	PM	IRP	ET-freshwater	HT-cancer	HT-non cancer	SQP
1 Vitradual (Anhui, China) (Results without recycled aluminium)	5.07E-01	2.26E+03	2.01E-05	4.17E+02	ND	2.88E+00	2.44E+04	-4.44E-06	-1.07E-03	ND
2 Vitradual (Anhui, China) (Results with recycled aluminium)	7.20E-02	1.32E+03	1.40E-05	5.67E+01	ND	2.59E+00	2.95E+02	1.55E-05	1.83E-03	ND
Percentage of change	-85.80%	-41.68%	-30.31%	-86.41%	ND	-10.21%	-98.79%	448.34%	270.64%	ND
3 Vitradual (Jiangsu, China) (Results without recycled aluminium)	5.32E-01	2.26E+03	2.49E-05	4.92E+02	ND	2.85E+00	2.59E+04	-6.07E-06	-1.29E-03	ND
4 Vitradual (Jiangsu, China) (Results with recycled aluminium)	7.15E-02	1.26E+03	1.85E-05	1.10E+02	ND	2.54E+00	3.95E+02	1.50E-05	1.78E-03	ND
Percentage of change	-86.56%	-44.15%	-25.88%	-77.66%	ND	-10.95%	-81.38%	347.78%	237.08%	ND

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