Statement of Verification

BREG EN EPD No.: 000620 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Architectural Panel Solutions Ltd

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:

1kg of Petrarch rainscreen cladding panel

Company Address

Architectural Panel Solutions Ltd
Unit 5, Wainwright Close
Hastings, St Leonards on Sea
East Sussex
TN38 9PP

D Patel	Deep Patel	05 August 2024
Signed for BRE Global Ltd	Operator	Date of this Issue
05 August 2024		04 August 2029
Date of First Issue		Expiry Date

Environmental Product Declaration

EPD Number: 000620

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE 2023 Product Category Rules (PN 514 Rev 3.1) for Type III environmental product declaration of construction products to EN 15804:2012+A2:2019.
Commissioner of LCA study	**LCA consultant/Tool**
Architectural Panel Solutions Ltd Unit 5, Wainwright Close Hastings, St Leonards on Sea East Sussex TN38 9PP	Consultant: Juan Barato, Architectural Panel Solutions Ltd Tool: BRE Lina A2
Declared/Functional Unit	**Applicability/Coverage**
1kg of Petrarch rainscreen cladding panel	Other (please specify). Product specific
EPD Type	**Background database**
Cradle to Gate with Module C and D	Ecoinvent 3.8

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☒ External
(Where appropriate [b])Third party verifier: Jiacheng (Francis) Yu
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019 for further guidance.

Information modules covered

Product			Construction		Use stage							End-of-life				Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building						
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw materials supply	Transport	Manufacturing	Transport to site	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
☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☑	☑	☑	☑

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Architectural Panel Solutions Ltd
Unit 5, Wainwright Close
Hastings, St Leonards on Sea
East Sussex
TN38 9PP

Construction Product:

Product Description

Petrarch Rainscreen Cladding Panel is created primarily from natural by-product materials such as stone and marble. A bespoke thermoset polymer-based and woven glass fibre reinforcement result in a durable panel with high strength and impact resistant. Petrarch has been designed and installed as a rainscreen cladding system with either open or closed joints. Panels can be fixed to the supporting wall using suitable rainscreen cladding support systems made of wood or metal.

Petrarch panels are available in standard nominal 7 and 10mm thicknesses, with dimensions of 3040 x 1210mm and 2430 x 1210mm. They come in four surface finishes: smooth standard, smooth matt, riven standard, and riven matt, and are offered in multiple colors, including a color matching service. The composition is similar across all product groups; therefore, the total production data of Petrarch rainscreen cladding panels has been calculated for 1 kg, allowing the end user to determine the impacts for different panel sizes.

Panel Thickness	Kg/m^2
7mm	15.7
10mm	22
Density	2240 kg/m^3

Fixing options:
- Mechanical Secret Fix (panel hangers)
- Adhesive Secret Fix
- Visible Fix (rivets to metal subframe or screws to timber battens)

Technical Information

Property	Value, Unit
Flexural Strength EN 14617-2:2016	>25MPa
Modulus of elasticity EN 14617-2:2016	>11,000 MPa
Freeze-Thaw EN 14617-5:2016	No significant loss in performance
Density	2240 kg/m^3

Note: Technical properties of all the panels assessed within this EPD.

Main Product Contents

Material/Chemical Input	%
Marble & Stone fillers	35-65
Fire Retardant	12-40
Bespoke Thermoset Polymer	15-18
Glass fibre	5-6
Pigments	0-3
Additives	0-1

Note: Main product contents of all the panels assessed within this EPD.

Manufacturing Process

Petrarch cladding boards are manufactured in the UK based factory in Hastings.

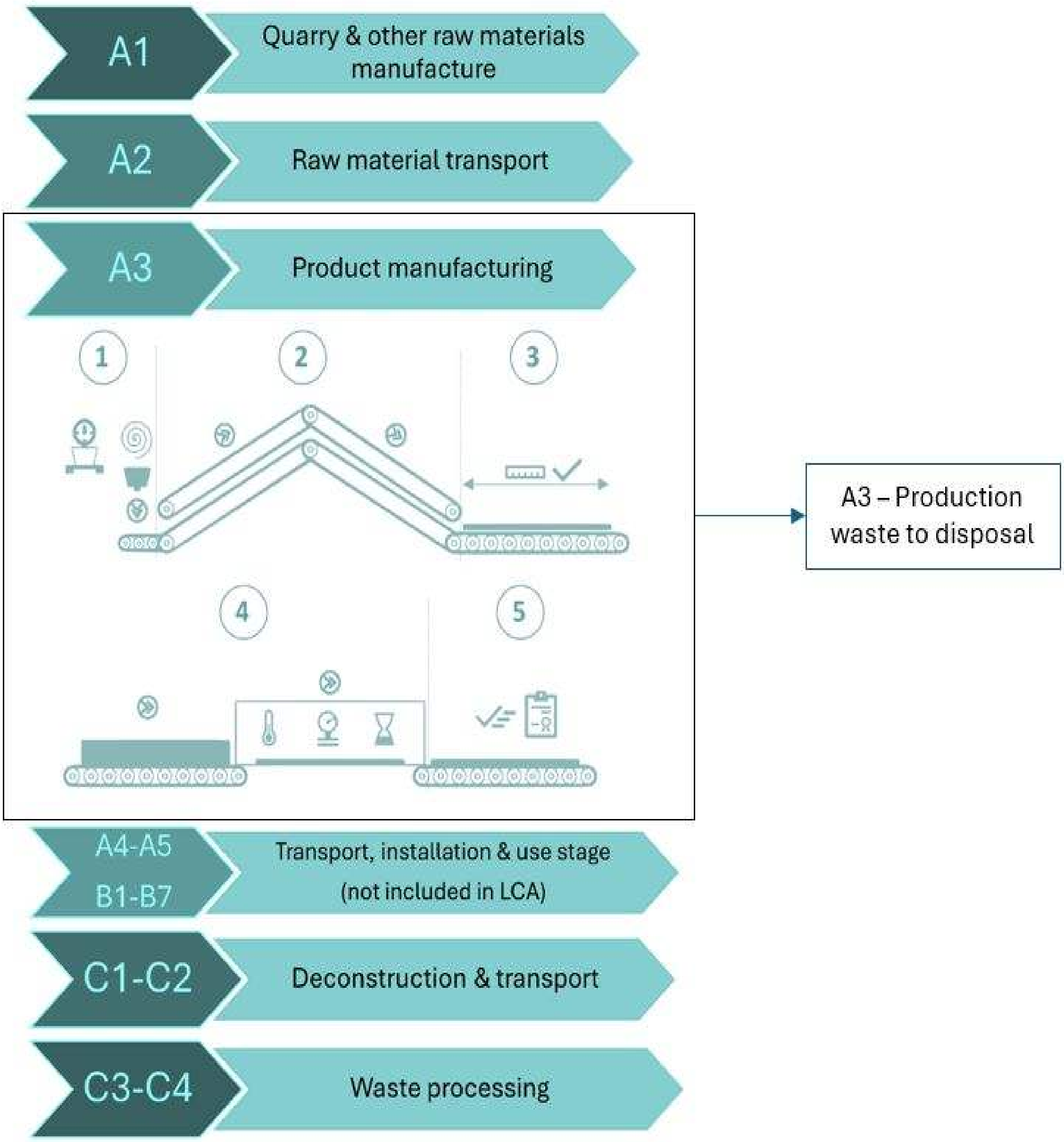
1. Each panel's unique colour recipe is weighed and mixed to create a malleable mixture that is poured onto a conveyor belt.
2. The mixture then passes through a series of rollers, each with a specific and very important task to achieve an even surface while reducing the thickness.
3. Once the required thickness is obtained, an automated mechanism activates, and the "blanket" is cut to the standard production length.
4. These "blankets" will then be transferred to a pressure chamber where a mould is applied under a specific temperature, pressure and time.

5. The boards will come out of this process with rough edges but already with Petrarch intrinsic strength properties. In-house visual and mechanical tests will be carried out to ensure product quality.

The following steps are dependent on finish and fabrication required:
• Standard finish - edge trimming to square the panels up.
• Matt finish - shotblast process followed by edge trimming.
Following the above processes, Petrarch panels are ready for either in-house fabrication (cutting, drilling, etc.) or can be shipped out for on-site fabrication.

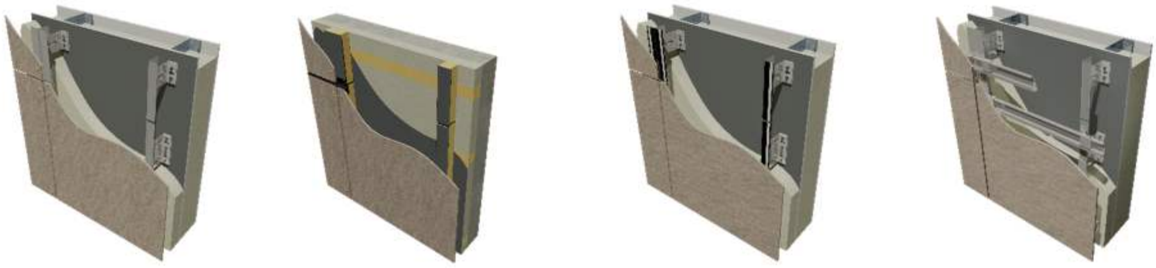
Any production product waste (shotblasting, scrap, offcuts, etc), packaging and line cleaning waste is handled, stored, and disposed of according to current regulations.

Process flow diagram



Construction Installation

Petrarch can be visible fixed (rivets or screws), adhesive secret fixed, or mechanical secret fixed (panel hangers with anchors) back to either a metal or wood subframe.



Use Information

Maintenance will not normally be required but, when necessary, cleaning can be carried out following manufacturer guidance.

End of Life

At the end of the product service life, the panels can be removed and may be reused on a different location within the same or another building. However, in the most of the scenario's panels will be recycled at its end of life. The method of deconstruction will vary dependent on panel installation method.

Visible fixed panels - Removal of panel is carried out using an electric drill or screwdriver by loosening the mechanical fixing (rivet or screw) to remove the panel.

Adhesive secret fixed panels - Removal of panel is carried out using mechanical cutting tools (sharp blade, handsaw, etc) or a cutting wire with handles to cut through the adhesive.

Mechanical secret fixed (hook on) - This installation method uses panel hangers affixed to the back of the panels, which will securely hook onto a horizontal carrier rail. To ensure stability, each panel has a fixed-point hanger (secured with a locking screw) positioned in the top row. Removal of panel is carried out using a screwdriver to loosen the locking screw on each panel, to then lift and remove the panel. Removal of panels must be done from top to bottom to get access to the locking screw.

Therefore, the demolition approach employed for the panels will vary considerably on a site-by-site basis due to its dependence on numerous factors, such as construction methodology, local geography, and panel installation. However, it can be safely assumed that the energy required for deconstructing the panels compared to the overall demolition will be effectively negligible.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1kg of Petrarch rainscreen cladding panel.

System boundary

This is a cradle-to-gate with modules C and D LCA, reporting all production life cycle stages of modules A1 to A3 and end of life stages C1-C4, and D in accordance with EN 15804:2012+A2:2019 and BRE 2023 Product Category Rules (PN 514 Rev 3.1).

Data sources, quality and allocation

The quantity used in the data collection for this EPD is the total quantity of Petrarch Rainscreen cladding panel manufactured during the data collection period (01/01/22-31/12/22). The original data collection form has been used while doing an LCA analysis, there was a no uplift in the given data. Architectural Panel Solutions manufactures other products in addition to Petrarch rainscreen cladding panel therefore the allocation of fuel consumption, water consumption & discharge, and waste emissions are required, and this has been done according to the provisions of the BRE PCR PN514 and EN 15804 i.e., by using the mass allocation. Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e., raw material production) from the Ecoinvent 3.8 database. All Ecoinvent datasets are complete within the context used and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN15804.

ISO14044 guidance. **Quality Level**	**Geographical representativeness**	**Technical representativeness**	**Time representativeness**
Very Good	Data from area under study.	Data from processes and products under study. Same state of technology applied as defined in goal and scope (i.e., identical technology).	n/a
Very Good	n/a	n/a	There is approximately 1-2 years between the Ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Specific UK and European have been selected from the Ecoinvent LCI for this LCA. Manufacturer uses the national grid electricity and natural gas for production, so therefore the most recent consumption mix has been used for the LCA modelling (Ecoinvent 3.8). The GWP carbon footprint for using 1 kWh of electricity, GB kWh is 0.239 kgCO2e/kWh and for using the 1 kWh of Natural gas (the UK) is 0.232 kgCO2eq. The quality level of time representativeness is also Very Good as the background LCI datasets are based on ecoinvent v3.8 which was compiled in 2021. Therefore, there is less than 5 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken

Cut-off criteria

All raw materials and energy input to the manufacturing process have been included, except for direct emissions to air, water, and soil, which are not measured. The inventory process in this LCA includes all data related to raw material, packaging material and consumable items. Process energy, process waste, water use, and discharge are included.

LCA Results

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CFC11 eq	mol H^+ eq	kg $(PO_4)^{3-}$ eq
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Total (Consumption grid)	A1-3	2.38E+00	2.21E+00	1.50E-01	1.33E-03	2.57E-07	1.17E-02	1.57E-03
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
90% Recycling and 10% Landfill									
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	8.32E-03	8.31E-03	7.08E-06	3.26E-06	1.92E-09	3.37E-05	5.35E-07
	Waste processing	C3	-3.62E-03	-3.62E-03	-1.28E-06	-3.61E-07	-7.73E-10	-3.76E-05	-1.12E-07
	Disposal	C4	1.06E-03	1.05E-03	8.10E-06	1.07E-06	3.20E-10	8.88E-06	3.06E-07
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-7.58E-03	-7.47E-03	-9.67E-05	-1.05E-05	-6.02E-10	-4.81E-05	-4.07E-06

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
GWP-biogenic = Global warming potential, biogenic;
GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
AP = Acidification potential, accumulated exceedance; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral&metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m^3 world eq deprived	disease incidence
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Total (Consumption grid)	A1-3	2.65E-03	2.58E-02	7.90E-03	1.13E-02	3.25E+01	1.04E+00	1.26E-07
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
90% Recycling and 10% Landfill									
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.02E-05	1.11E-04	3.40E-05	2.89E-08	1.26E-01	5.65E-04	7.17E-10
	Waste processing	C3	-1.66E-05	-1.82E-04	-5.01E-05	-1.86E-09	-4.96E-02	-1.15E-04	-7.70E-09
	Disposal	C4	3.06E-06	3.33E-05	9.64E-06	3.44E-09	2.47E-02	1.11E-03	1.78E-10
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.11E-05	-1.33E-04	-3.44E-05	-7.06E-08	-1.10E-01	-1.44E-02	-6.07E-10

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;
ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
PM = Particulate matter.

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts							
			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG
	Total (Consumption grid)	A1-3	1.80E-01	1.52E+02	3.35E-09	9.61E-08	1.14E+01
Construction process stage	Transport	A4	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND
90% Recycling and 10% Landfill							
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	6.46E-04	9.81E-02	3.18E-12	1.03E-10	8.63E-02
	Waste processing	C3	-2.24E-04	-2.90E-02	-1.12E-12	-2.10E-11	-6.32E-03
	Disposal	C4	1.17E-04	1.76E-02	7.58E-13	1.18E-11	5.92E-02
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.70E-03	-1.27E-01	-7.39E-12	-1.34E-10	-1.01E-01

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;
HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG
	Total (Consumption grid)	A1-3	4.14E-01	1.80E+00	2.21E+00	2.83E+01	5.81E+00	3.41E+01
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
90% Recycling and 10% Landfill								
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.77E-03	0.00E+00	1.77E-03	1.23E-01	0.00E+00	1.23E-01
	Waste processing	C3	2.78E-04	0.00E+00	2.78E-04	4.87E-02	0.00E+00	4.87E-02
	Disposal	C4	4.22E-04	0.00E+00	4.22E-04	2.43E-02	0.00E+00	2.43E-02
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.03E-02	0.00E+00	-1.03E-02	-1.10E-01	0.00E+00	-1.10E-01

PERE = Use of renewable primary energy excluding renewable primary energy used as raw materials;
PERM = Use of renewable primary energy resources used as raw materials;
PERT = Total use of renewable primary energy resources;
PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
PENRM = Use of non-renewable primary energy resources used as raw materials;
PENRT = Total use of non-renewable primary energy resource

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG
	Total (Consumption grid)	A1-3	5.46E-03	1.30E-06	0.00E+00	2.49E-02
Construction process stage	Transport	A4	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
90% Recycling and 10% Landfill						
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	1.40E-05
	Waste processing	C3	1.91E-05	0.00E+00	0.00E+00	-2.83E-06
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	2.62E-05
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-3.39E-04

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG
	Total (Consumption grid)	A1-3	5.08E-01	6.64E+00	8.16E-05
Construction process stage	Transport	A4	MND	MND	MND
	Construction	A5	MND	MND	MND
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
90% Recycling and 10% Landfill					
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.39E-04	2.46E-03	8.50E-07
	Waste processing	C3	6.51E-05	4.57E-04	3.43E-07
	Disposal	C4	4.80E-05	1.01E-01	1.48E-07
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-6.33E-04	-1.93E-02	-5.62E-07

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Other environmental information describing output flows – at end of life								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG
	Total (Consumption grid)	A1-3	0.00E+00	8.94E-02	1.21E-08	1.09E-03	0.00E+00	-9.05E-03
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
90% Recycling and 10% Landfill								
End of life	Deconstruction, demolition	C1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
	Transport	C2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
	Waste processing	C3	0.00E+0	9.00E-01	0.00E+0	0.00E+0	0.00E+0	0.00E+0
	Disposal	C4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
C1 - Deconstruction	At the end of the product service life, the panels can be removed and may be reused on a different location within the same or another building. However, in most scenarios panel cannot reach its 100% durability and will be recycled at its end of life. The method of deconstruction will vary dependent on panel installation method. Visible fixed panels - Removal of panel is carried out using an electric drill or screwdriver by loosening the mechanical fixing (rivet or screw) to remove the panel. Adhesive secret fixed panels - Removal of panel is carried out using mechanical cutting tools (sharp blade, handsaw, etc) or a cutting wire with handles to cut through the adhesive. Mechanical secret fixed (hook on) - This installation method uses panel hangers affixed to the back of the panels, which will securely hook onto a horizontal carrier rail. To ensure stability, each panel has a fixed-point hanger (secured with a locking screw) positioned in the top row. Removal of panel is carried out using a screwdriver to loosen the locking screw on each panel, to then lift and remove the panel. Removal of panels must be done from top to bottom to get access to the locking screw. Therefore, the demolition approach employed for the panels will vary considerably on a site-by-site basis due to its dependence on numerous factors, such as construction methodology, local geography, and panel installation. However, it can be safely assumed that the energy required for deconstructing the panels compared to the overall demolition will be effectively negligible. The recovered panels will be sent to the waste processing unit.		
C2 – Transportation	50km by road has been modelled for module C2 as a typical distance from the demolition site to the recycling plant. However, end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module C2 if required.	Fuel per km	0.267
	Transportation	Road transport	Lorry, 16-32 metric ton
	Distance	km	50
C3- Waste processing	The end-of-life scenario for the cladding panels will depend on their durability. If the panels are in good condition, they can be reclaimed and reused in other construction projects. However, in most cases, panels cannot be recovered with 100% durability. Therefore, in this scenario, a 100% product will be recovered from the demolition site and 90% of the product will be recycled and 10% sent to landfill (EN 15804+A2 PN514 Rev 3.1 - referenced the External wall Cladding panel scenario). The recovered panels can be crushed into aggregate or powder and used as a component in concrete or for flooring purposes. During the pre-processing, it is assumed that 10% of the product cannot be recovered and will end up in landfills. The energy used for processing the recovered steel is not included in module C3, it is assumed to be very small and are effectively negligible.		
	Cladding panel waste	kg	0.9
C4 – Disposal	10% of the product cannot be recovered and will end up in landfills.	kg	0.1

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
Module D	“Benefits and loads beyond the system boundary" (module D) accounts for the environmental benefits and loads resulting from the recycling of panels. Since the panels are made of materials such as marble, slate powder, resins, etc., it is assumed that 90% of the product will be recycled at the waste processing unit. The recovered panels will then be reused in various building applications. To calculate the benefits of recycling the panels, the pre-existing content should be excluded from the calculation. While checking the backend ecoinvent 3.8 database for the recycled content, the datasets resulted in values of less than 0.001 kg, which is minimal and can be considered negligible. Furthermore, it is assumed that there is a 100% recycling yield from the recycling process.		

Interpretation of results:

The manufacture of the raw materials has the greatest influence across all impact categories, including the manufacture of the bespoke thermoset polymer-based material, the glass fibers, pigments, etc. Out of the total mass of input materials, crushed marble and stone fillers accounts for 40-45%, Fire Retardant 1* accounts for 30-35%, bespoke thermoset polymer-based material for 15-20%, and the remaining input materials make up the remaining 0-15%.

*Fire Retardant 1 and Stone Filler 1 information not shown on EPD but disclosed for LCA purposes only.

References

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A2:2019. London, BSI, 2019.

BSI. Environmental labels and declarations – Type III Environmental declarations – Principles and procedures. BS EN ISO 14025:2010 (exactly identical to ISO 14025:2006). London, BSI, 2010.

BSI. Environmental management – Life cycle assessment – Principles and framework. BS EN ISO 14040:2006. London, BSI, 2006.

BSI. Environmental management – Life cycle assessment – requirements and guidelines. BS EN ISO 14044:2006. London, BSI, 2006.

BRE Global Product Category Rules (PCR) For Type III EPD of Construction Products to EN 15804+A2, PN 514 Rev 3.1, Feb 2023.

BS EN 14617-2 Agglomerated stone - Test methods - Part 2: Determination of flexural strength (bending)

BS EN 14617-5 Agglomerated stone. Test methods - Determination of freeze and thaw resistance