

Statement of Verification

BREG EN EPD No.: 000699

Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Hambleside Danelaw Ltd



is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

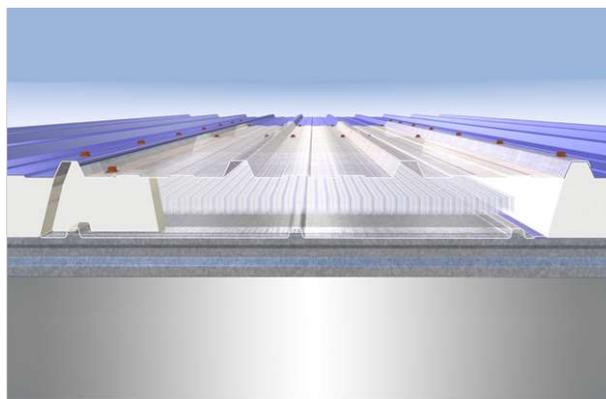
BRE Global Scheme Document SD207

This declaration is for:

1 linear metre of FAIR (Factory Assembled) Zenon PF-01 weighing 4.85 kgs

Company Address

Hambleside Danelaw Ltd.
Long March
Daventry
Northamptonshire
NN11 4NR



Hambleside Danelaw
Building Products



Signed for BRE Global Ltd

Hayley Thomson
Operator

28 April 2025
Date of this Issue

28 April 2025
Date of First Issue

27 April 2030
Expiry Date



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Environmental Product Declaration

EPD Number: 000699

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
Hambleside Danelaw Ltd. Long March Daventry Northamptonshire NN11 4NR	BRE LINA A2
Declared/Functional Unit	Applicability/Coverage
1 linear metre of FAIR (Factory Assembled) Zenon PF-01 weighing 4.85 kgs	Product specific
EPD Type	Background database
Cradle to Gate with Module C and D and options	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 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	
(Where appropriate ^b)Third party verifier: Roger Connick	
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
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>								

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Hambleside Danelaw Ltd
 Long March
 Daventry
 Northamptonshire
 NN11 4NR

Construction Product:

Product Description

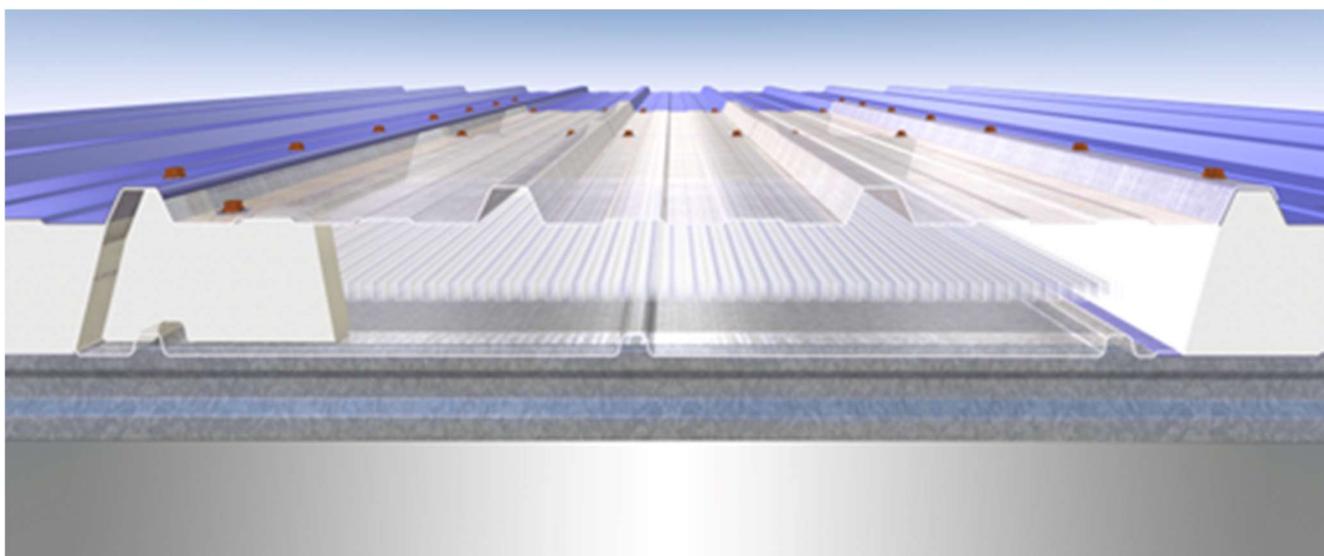
Zenon in-plane composite panel rooflights, also referred to as factory assembled insulated rooflights (FAIRs) are profiled, triple skin, translucent GRP products, comprising of a weather sheet, liner panel, and a layer of insulation. Manufactured in various fire ratings and thermal performances to suit the building's specification requirements. They are typically 1000mm cover width and are profiled to match the major UK composite (insulated) panel manufacturers. The design and width are the same across the system and the length will be varied according to projects. Therefore, the LCA analysis was conducted for 1 linear meter, which allows the end user to scale the LCA results for different lengths.

Technical Information

Property	Value, Unit
Material	Glass Reinforced Polyester (GRP) to BS EN 1013:2012+A1:2014 (UK Annex)
Insulant	Zenon Insulator honeycomb
Profile	To match profiled composite metal system with varying box depths
Length	To suit application
Cover Width	To match profiled composite metal system
Finish	Natural translucent
Fire Properties	Outer: External Fire Exposure to BS476-3; S.AB and BROOF(t4) to EN13501-5. Liner: Surface Spread of Flame to BS 476-7; Class 1 and TP(a) rigid to BS 2782-0 Method 508A.

Property	Value, Unit
End lap lengths	150mm with the fixings at the centre of the lap.
L-Solar	60%
T-Solar	60%
U Value	1.2 W/m ² K
Non-Fragility Classification	Class B
Additional Information	Manufactured using UV stabilized resins and Zenon Shield surface protection. UKCA and CE marked in accordance with BS EN 1013:2012+A1:2014 (UK Annex). Performance data obtained through physical testing programme at National Physical Laboratory.

The technical information is gathered from the product specification document, please contact Hambleside Danelaw for details. For full installation details including liner and insulant, please refer to manufacturer's installation recommendations.



Main Product Contents

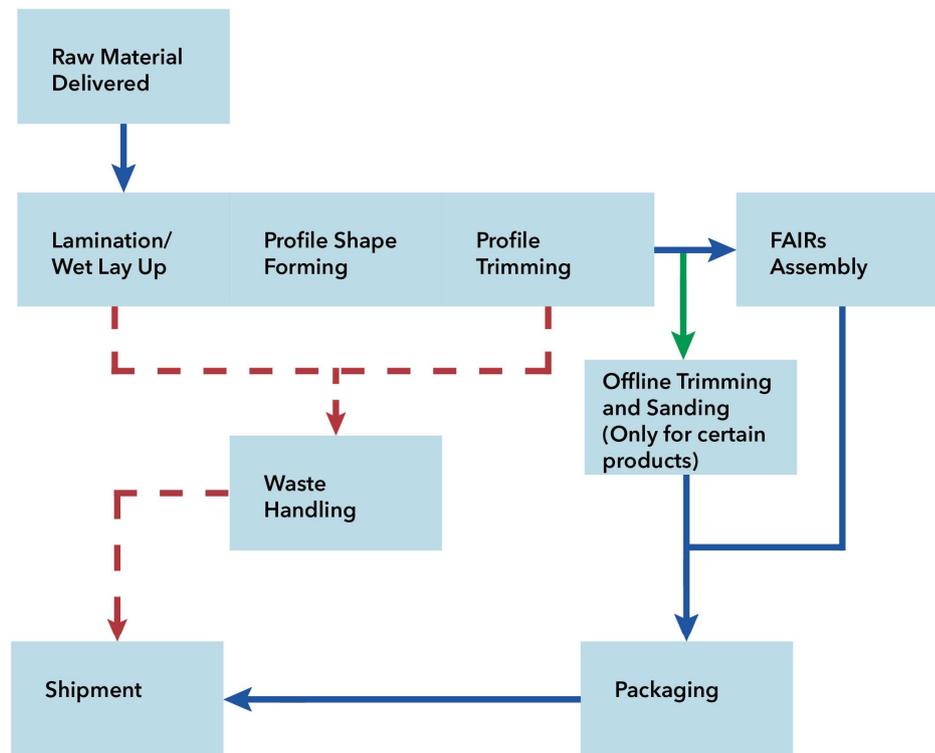
Material/Chemical Input	%
Resin	49.14
Glass Fibre	24.57
Minor Chemicals	1.01
Fillers	4.83
Film	4.82
Insulation	6.27
Steel Strips	2.52
Hotmelt	0.39
Sealant	1.86
Adhesive	3.92
Foam Tape	0.45
Pop Rivet	0.22

Note: The composition applies to 1 linear metre of FAIR (Factory Assembled) Zenon PF-01 system. There is no variation in thickness and materials.

Manufacturing Process

A controlled combination of raw materials, including resin and glass rovings are laid down on to a flat carrier film. This combination is then formed into the profile required and heated until it has cured. The cured profile shape is then trimmed to the length and width required against the customer's order. If the GRP is being used in a multi-skin factory assembled application (FAIR) then it undergoes an additional process to assemble the layers together. The finished product is then packaged and shipped to the customer.

Process flow diagram



Construction Installation

1. Rooflight Composite Panel

GRP (Glass Reinforced Polyester) rooflights, in a variety of profiles, different specifications and weights to meet all customer requirements.

2. Primary Fixings

There should always be a minimum of 5 fixings per purlin. These fixings should have a minimum 29mm diameter self-sealing washer with a poppy red cap. Due to differences in design profiles available, the number and position of fixings varies. Ideally, the fixings should be positioned as evenly as possible across the profile of the sheet and central to each trough. Wider troughs may need two each.

3. Side Stitch Fastener

A sidelap stitch fastener is used when fixing the rooflight sidelaps over the metal profile. These fixings should have a poppy red cap and use a minimum of a 16mm diameter self-sealing washer and be placed at a maximum of 400mm centres. When not using a steel fixing strip incorporated into the rooflight construction,

an expanding grommet type fastener should be used to fasten the side lap of the metal over the rooflight. Where non-fragile performance is required, these should be metal Fab-Lok or similar types.

4. Steel Fixing Strip

An optional galvanised steel strip is fitted into the rooflight during fabrication enabling the installer to use standard sidelap stitchers.

5. Sidelap Sealant

The sidelap sealant is essential and must be installed on the crown of the underlapping panel. The sealant should be a continuous 6x5mm butyl type strip.

6. End Lap Sealant

The sealant strips should be 6x5mm, 6mm Ø or 8mm Ø bead butyl type strip sealant. Two strips should be positioned approximately 10 to 15mm either side of the fixing, and a further strip positioned 15mm from the outer end lap. Where a better seal is required at the bottom of the lap to keep out dirt and trapped water, a bead of premium quality neutral cure silicone sealant positioned approximately 10 to 15mm from the bottom of the lap may be used as an alternative to the butyl strip.

7. Spreader Plate

A spreader plate is recommended to ensure that the composite panels and rooflights have a secure bearing. The composite rooflight must bear onto the purlin or 1.5mm min. thick spreader plate by no less than 25mm.

Use Information

Maintenance - Clean periodically with warm water and soap solution, avoid harsh detergents. Remove persistent stains by rubbing with a bristle brush. Remove tar and grease with white spirit.

Repairs - Dependent upon condition. Repairs sometimes possible; seek advice from Technical Department.

End of Life

At the end of life, the product can be disposed of via landfill or alternatively can be sent to an Energy from waste (EFW) plant where it is converted to SRF (Solid Recovery Fuel). Following this sophisticated SRF manufacturing process, the end product produced has a high calorific value and is a resource from which energy can be harnessed. It is used in cement kilns, paper mills and power stations as an alternative to fossil fuels. According to EN 15359, SRF should have an NCV between 15 and 25 MJ/kg, with chlorine content under 1% and mercury under 0.08 mg/MJ. If there is an interest in SRF pertains to its use in processes involving GRP, such as co-combustion with other materials, it's essential to consider the specific calorific value, chlorine content, and other chemical properties of the SRF to ensure compatibility and efficiency.

However, as the end-of-life options are site dependent, industrial average end-of-life data has been used for this EPD according BRE PCR for Type III EPD of Construction Products to EN 15804+A2, i.e. 95% of the steel and aluminium waste are recycled and 5% are landfilled, 100% GRP waste are incinerated.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1 linear metre of FAIR (Factory Assembled) Zenon PF-01 weighing 4.85 kgs

System boundary

This is a Cradle-to-Gate with Module C & D and options LCA, reporting all production life cycle stages of modules A1 to A3, construction stages A4, A5 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

Specific primary data derived from Hambleside Danelaw’s production process at Long March, Daventry, Northamptonshire NN11 4NR factory, have been modelled using the LINA LCA A2 software A2 and the ecoinvent 3.8 database. In accordance with the requirements of EN 15804:2012+A2:2019, the most current available data has been used. The manufacturer-specific data from Hambleside-Danelaw covers a period of one year (01/01/2023 – 31/12/2023). 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 EN 15804:2012+A2:2019.

The LCA study is for Zenon PF-01 product. The factory also produces other products. All energy, water and waste have been allocated to the product by linear metre according to the provisions of the BRE PCR PN514 Rev 3.1 and EN 15804:2012+A2:2019. Site wide values for energy, water and wastewater have been taken from bills. Figures for the raw materials, ancillary materials and packaging were from actual usages.

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).	There is less than 5 years between the ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Specific UK datasets have been selected from the ecoinvent LCI for this LCA. The quality level of geographical and technical representativeness is therefore very good. The quality level of time representativeness is 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.

UK Consumption mix was used for electricity with an emissions factor of 0.239kgCO₂e/kWh.
 UK Natural gas data (at industrial furnace) was used with an emissions factor of 0.232 kgCO₂eq/kWh.
 UK renewable electricity (roof, mono solar PV) was used with an emission factor of 0.125 kgCO₂e/kWh.

Cut-off criteria

All processes associated with the manufacturing process have been included. All inputs or outputs have been included and all raw materials, packaging and transport, energy, water use, emissions, and wastes, are included, except for direct emissions to water and soil, which are not measured. No ancillary materials are required. Upstream extraction and/or processing of inputs are included within the use of the background datasets within LINA. Unspecified organic chemical has been selected as a proxy for the accelerator and catalyst input materials as there is no chemical information for accelerator and catalyst.

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 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 (of product stage)	A1-3	2.16E+01	2.19E+01	-4.18E-01	6.53E-02	2.14E-06	9.78E-02	5.11E-03
Construction process stage	Transport	A4	1.69E-01	1.68E-01	1.44E-04	6.62E-05	3.90E-08	6.84E-04	1.09E-05
	Construction	A5	1.95E+00	1.04E+00	8.45E-01	6.76E-02	1.10E-07	4.98E-03	8.01E-04
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
100% GRP waste to incineration+ 95% metal waste to recycling+ 5% metal waste to landfill scenario									
End of life	Deconstruction, demolition	C1	4.32E-02	4.32E-02	1.96E-05	5.57E-06	7.27E-09	2.10E-04	8.31E-07
	Transport	C2	2.42E-02	2.42E-02	2.06E-05	9.50E-06	5.60E-09	9.82E-05	1.56E-06
	Waste processing	C3	1.12E+01	1.12E+01	1.07E-03	9.98E-05	2.63E-08	2.68E-03	3.44E-05
	Disposal	C4	5.31E-05	5.28E-05	2.19E-07	5.35E-08	1.53E-11	4.39E-07	9.04E-09
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-4.43E+00	-4.36E+00	-5.75E-02	-4.90E-03	-2.92E-07	-2.51E-02	-2.46E-03

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 (of product stage)	A1-3	1.79E-02	1.94E-01	7.57E-02	2.11E-04	3.72E+02	1.35E+01	1.06E-06
Construction process stage	Transport	A4	2.06E-04	2.25E-03	6.89E-04	5.86E-07	2.55E+00	1.15E-02	1.45E-08
	Construction	A5	1.80E-03	1.09E-02	4.05E-03	1.05E-05	1.85E+01	9.43E-01	5.94E-08
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
100% GRP waste to incineration+ 95% metal waste to recycling+ 5% metal waste to landfill scenario									
End of life	Deconstruction, demolition	C1	2.94E-04	9.12E-04	3.19E-04	3.37E-08	4.70E-01	2.79E-03	4.62E-09
	Transport	C2	2.96E-05	3.23E-04	9.89E-05	8.41E-08	3.66E-01	1.65E-03	2.09E-09
	Waste processing	C3	1.49E-03	1.28E-02	3.12E-03	9.23E-07	2.21E+00	7.12E-01	1.47E-08
	Disposal	C4	1.39E-07	1.52E-06	4.43E-07	1.19E-10	1.19E-03	5.05E-05	8.14E-12
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-3.76E-03	-3.72E-02	-1.07E-02	-2.74E-06	-6.85E+01	-1.82E+00	-1.81E-07

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 (of product stage)	A1-3	1.72E+00	5.24E+02	1.77E-08	6.26E-07	1.12E+02
Construction process stage	Transport	A4	1.31E-02	1.99E+00	6.44E-11	2.08E-09	1.75E+00
	Construction	A5	1.25E-01	2.90E+01	2.69E-09	2.13E-08	8.00E+00
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
100% GRP waste to incineration+ 95% metal waste to recycling+ 5% metal waste to landfill scenario							
End of life	Deconstruction, demolition	C1	2.32E-03	3.03E-01	5.46E-12	1.91E-10	1.81E-01
	Transport	C2	1.88E-03	2.85E-01	9.24E-12	2.99E-10	2.51E-01
	Waste processing	C3	7.04E-03	2.36E+01	1.01E-09	3.82E-08	7.33E-01
	Disposal	C4	5.70E-06	3.29E-01	3.36E-14	8.80E-13	2.26E-03
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.13E+00	-6.58E+01	-1.80E-09	-3.68E-08	-1.97E+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 (of product stage)	A1-3	2.16E+01	7.73E+00	2.93E+01	2.80E+02	8.98E+01	3.70E+02
Construction process stage	Transport	A4	3.59E-02	0.00E+00	3.59E-02	2.50E+00	0.00E+00	2.50E+00
	Construction	A5	-4.32E+00	7.36E+00	3.04E+00	7.36E+00	9.22E+00	1.66E+01
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
100% GRP waste to incineration+ 95% metal waste to recycling+ 5% metal waste to landfill scenario								
End of life	Deconstruction, demolition	C1	-1.27E+01	1.27E+01	2.34E-02	-2.47E+00	3.08E+00	6.14E-01
	Transport	C2	5.15E-03	0.00E+00	5.15E-03	3.59E-01	0.00E+00	3.59E-01
	Waste processing	C3	8.40E-02	0.00E+00	8.40E-02	-1.43E+02	1.45E+02	2.19E+00
	Disposal	C4	2.67E-05	0.00E+00	2.67E-05	1.17E-03	0.00E+00	1.17E-03
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.00E+01	0.00E+00	-1.00E+01	-6.88E+01	0.00E+00	-6.88E+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 (of product stage)	A1-3	4.07E-01	3.28E-06	0.00E+00	3.20E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	2.84E-04
	Construction	A5	3.51E-02	6.39E-09	0.00E+00	2.24E-02
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
100% GRP waste to incineration+ 95% metal waste to recycling+ 5% metal waste to landfill scenario						
End of life	Deconstruction, demolition	C1	9.69E-06	6.39E-09	0.00E+00	6.73E-05
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	4.08E-05
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	1.66E-02
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	1.19E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-4.54E-02

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 (of product stage)	A1-3	1.05E+00	2.34E+01	8.07E+00
Construction process stage	Transport	A4	2.81E-03	4.99E-02	1.72E-05
	Construction	A5	1.36E-01	2.53E+00	5.41E-05
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
100% GRP waste to incineration+ 95% metal waste to recycling+ 5% metal waste to landfill scenario					
End of life	Deconstruction, demolition	C1	2.53E-03	1.52E-01	4.00E-06
	Transport	C2	4.03E-04	7.16E-03	2.47E-06
	Waste processing	C3	1.72E-01	4.96E+00	5.45E-06
	Disposal	C4	8.99E-06	5.91E-04	7.05E-09
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-3.11E-01	-1.48E+01	-3.40E-04

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 (of product stage)	A1-3	0.00E+00	4.46E-02	4.01E-01	2.65E-03	-1.02E-01	-1.84E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	1.11E-07	4.72E-11	5.09E-06	2.53E-01	0.00E+00
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
100% GRP waste to incineration+ 95% metal waste to recycling+ 5% metal waste to landfill scenario								
End of life	Deconstruction, demolition	C1	0.00E+00	1.76E+00	3.00E-08	5.09E-06	4.04E-01	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	4.72E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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
A4 – Transport to the building site	Based on a typical delivery trip from location of manufacture in Daventry to Manchester		
	Fuel type / Vehicle type:	Litre of fuel type per distance or vehicle type	Road Transport via 16-32 ton lorry
	Distance:	km	209
	Bulk density	kg/m ³	1.38
	Utilisation	%	100
A5 – Installation in the building	This scenario assumes the following energy, ancillary materials and packaging waste are associated with the products installation on site. The scenario assumes no installation wastage of the rooflight as the product is installed on site as a premanufactured unit.		
	Sealant	kg	0.29
	Screws	kg	0.15
	Transport for Diesel	km	30
	Diesel for Crane	kg	0.000024
	Drill Electricity	kWh	0.00116944
	Emission to air - Exhaust fumes (Crane)	kg	0.000024
	Packaging waste - Wood Waste	kg	0.494
	Packaging waste - Cover Sheets – GRP waste	kg	0.038046
	Packaging waste - Cover Sheets – PC waste	kg	0.0030744
Packaging waste - Polythene Wrap waste	kg	0.116827	
C1 to C4 End of life,	Description of scenario		
C1 – Deconstruction	It has been assumed that the product will be dismantled at the building's end of service life, where a crane will be used to bulldoze the building.		
	Transport of Diesel	km	30
	Electricity Use	kWh	0.00116944
	Diesel for Crane	kg	0.000024
	Sealant – to landfill	kg	1
	Screws to landfill	kg	0.15
	Estimate of typical distance to landfill		

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
C2 – Transport from site to pre-processing facility or landfill	Road, 16-32 metric ton, euro5	km	30
C3 - Pre-processing of uninstalled product	<p>There is currently no process in place to dispose of the product waste. Therefore, industrial average end-of-life data for stainless steel and aluminium has been used according to BRE PCR PN 514 Rev 3.1, i.e. 95% of waste to recycling. Steel and aluminium make up 2.73% of the composition for 1 declared unit, i.e. 0.1326kg. So $95\% \times 0.1326 = 0.126\text{kg}$ will be recycled.</p> <p>For the rest of the product waste, industrial average end-of-life data for 'Cladding panel, glass reinforced plastic (GRP)' and 'Vapour control layer, polythene' has been used according to BRE PCR PN 514 Rev 3.1, i.e. 100% of waste to incineration. So the rest 4.718kg will be incinerated.</p>		
	Waste to Incineration (plastic)	kg	4.718
	Waste to recycling (steel)	kg	0.116
	Waste to recycling (aluminium)	kg	0.01
C4 – Disposal	<p>There is currently no process in place to dispose of the product waste. Therefore, industrial average end-of-life data for stainless steel and aluminium has been used according to BRE PCR PN 514 Rev 3.1, i.e. 5% of waste to landfill. Steel and aluminium make up 2.73% of the composition for 1 declared unit, i.e. 0.1326kg. So $5\% \times 0.1326 = 0.00663\text{kg}$ will be landfilled.</p>		
	Wate to landfill (steel)	kg	0.0061
	Wate to landfill (aluminium)	kg	0.00053
Module D	<p>95% i.e. 0.126 kg of steel and aluminium waste will be sent to recycling plant. Out of which, steel contains 37.8% of existing post-consumer waste and aluminium contains 26.1% of existing post-consumer waste.</p> <p>Therefore, only 62.2% of virgin steel can be declared in Module D, i.e. 0.0721kg, only 73.9% of virgin aluminium can be declared in Module D, i.e. 0.00743kg.</p> <p>4.718kg plastic waste is declared in Module D for energy recovery benefits. As there is a lack of GRP incineration data, plastic mixture waste to incineration dataset has been used as a proxy for GRP incineration.</p>		
	Benefits due to recycling of steel	kg	0.0721
	Benefits due to recycling of aluminium	kg	0.00743
	Benefits due to incineration of plastic mixture	kg	4.718

Interpretation

Out of the total mass of input materials, resin accounts for 49.1%, glass fibres account for 24.8%, cellulose fibre accounts for 6.3%, fillers, adhesives, films account for 4.8% respectively, steel accounts for 2.5%, sealant accounts for 1.9%, additives account for 0.8% and aluminium accounts for 0.2%. The bulk of the environmental impacts and primary energy demand are attributed to the manufacturing phase, covered by information modules A1-A3 of EN15804:2012+A2:2019.

As a result, resin contributes the most on GWP and overall environmental impacts.

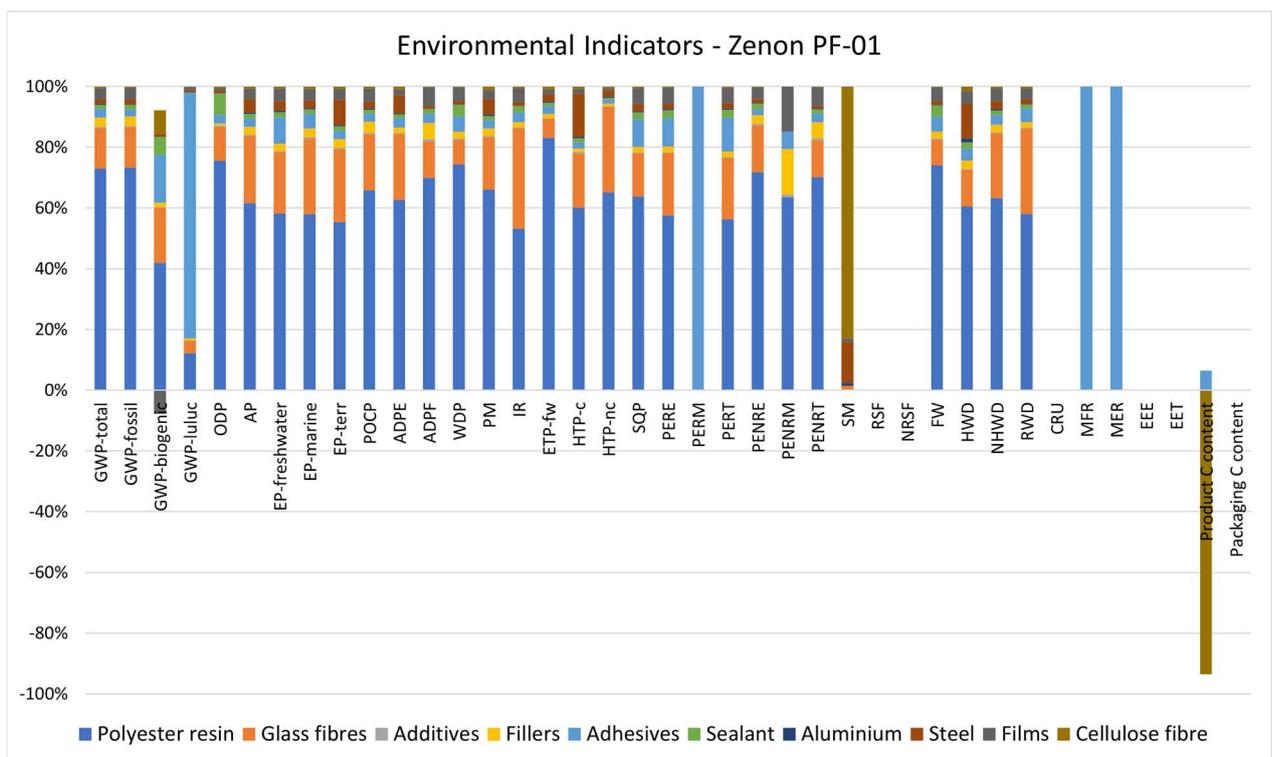


Figure 1

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