Statement of Verification

BREG EN EPD No: 000774 Issue: 01

This is to verify that the Environmental Product Declaration provided by:

Gradus Limited

are in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:
1 meter of Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products with an average weight of 0.59 kg/m.

Company Address

Park Green,
Macclesfield,
Cheshire
SK11 7LZS

GRADUS

Signed for BRE Global Limited — Hayley Thomson, Operator

Date of this Issue	Date of First Issue	Expiry Date
10 April 2026	10 April 2026	09 April 2031

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Environmental Product Declaration

EPD Number: 000774

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Environmental Profiles 2025 Product Category Rules for Type III environmental product declaration of construction products to EN 15804+A2 PN 514 Rev 3.2
Commissioner of LCA study	**LCA consultant/Tool**
Gradus Limited	Regina Poveda BRE LINA V2.0
Declared/Functional Unit	**Applicability/Coverage**
1 meter of Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products with an average weight of 0.59 kg/m.	Product Average.
EPD Type	**Background database**
Cradle to Grave	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: Kim Allbury
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)

Springbank
Lyme Green Business Park,
Brunel Rd,
Cheshire,
Macclesfield
SK11 0TA

Winsford
Gerflor Flooring UK Building,
16 Road One,
Winsford
CW7 3QA

Construction Product:

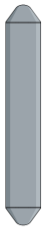
Product Description

Gradus Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products protect interior surfaces by preventing damage from impact, abrasion and movement of equipment or furniture. All of these products have the same material composition.

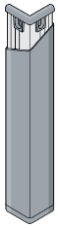
This is an average EPD and includes the following Wall Guards, Wall Strips, Bed Head Protectors and Corner Guard products.

Wall Guards (WGA100, WGS200, WGS125)

Wall Strips (WST150, WST200)



Bed Head Protector (BHPA100, BHPA125)



Corner guards (CGH5090, CGH7590, CGH75135, CGFLX60, CGS2590, CGS7590, CGC2590, CGS5090, CGC5090, CGC7590)

Technical Information

Property	Wall Guard	Wall Strips	Bed head protector	Corner Guards
Length	4.0 m	4.0 m	Supplied as part of a kit 750mm long 2 units	0.8m, 1.0m, 1.22m, 2.0m, 2.44m, 2.7m and 4.0m
Colour	33	32	33	34-35

Note: Technical information is available in the brochure, "Wall Protection Systems."
https://www.gradus.com/download/brochure-wall-protection-systems

Main Product Contents

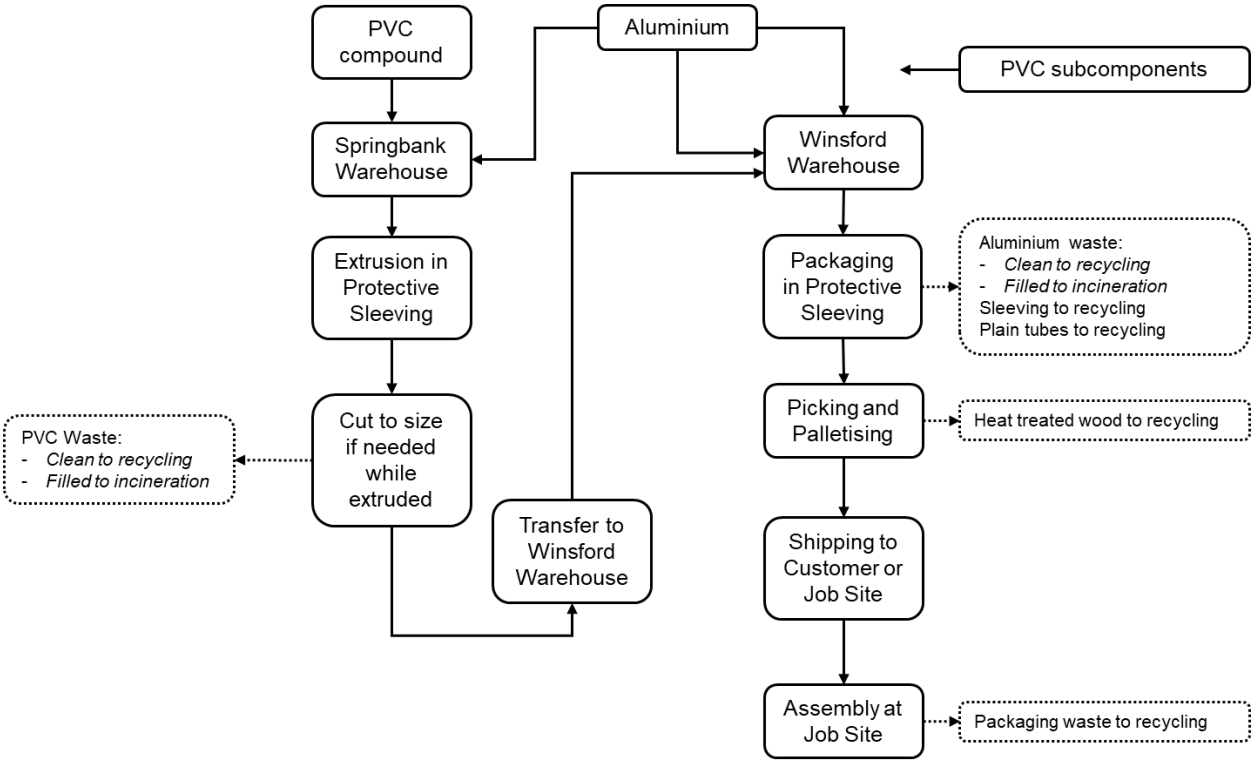
Material/Chemical Input	%
Polyvinyl chloride extruded forms (PVC)	72
Aluminium	28

Manufacturing Process

The PVC and aluminium are bought from a supplier in the UK and stored at the manufacturing sites. The PVC is stored at Springbank, and its processing is done in this facility.
The PVC is extruded into rigid lengths, cut as it is extruded and sleeved before it is transferred to the Winsford warehouse. The aluminium used during the process could be sourced from either the Springbank storage or the Winsford warehouse, depending on the availability of space. Also, the Winsford site manages inbound deliveries of subcomponents, such as endcaps, returns and reveals.
Once the PVC compound is transferred to the Winsford warehouse, both raw materials are consolidated, palletised and dispatched either directly to the customer or to designated job sites for installation.
At the installation site, the profiles are assembled with the corresponding subcomponents to form the finished product.

The electricity used at the Springback and Winsford sites is from the grid, and natural gas has been considered for the Springbank facility, which is used for heating.
Water is used as a closed-loop system on extruder lines.

Process flow diagram



Construction Installation

The transport distance to the construction site is set at 688 km by road, considering that the construction sites are based in the UK. All Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products are sent via Gradus own transport. Vehicles leave loaded and make multiple drop-offs on their route. These trucks are then utilised depending on the route to bring raw material back from suppliers, like raw PVC from a supplier.
Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products installation happens at the final part of the construction project. Well before the job commences, the project team will price the job and work out the total meterage needed for the job. Once the materials have been delivered to the site, our contracts team will move the material to the specific part of the job for installation. All Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products come as precut sections and no trimming or cutting would be needed at the job site.

Use Information

Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products are installed in public buildings as protection on corners. After installation, the maintenance of the Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products includes only regular cleaning, which can be done as needed by customer requirements.
If a section of Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products is damaged, the product is replaced with another one. For this LCA analysis, it is assumed that Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products will be replaced once every 20 years. This assumption is based on Wall protection warranty. Please contact Gradus Ltd for more information.

During its use, Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products do not require energy and/or water for normal operation.

End of Life

The building demolition can be done using different methods, which are linked to construction methodology and local geography. When the product reaches its End-of-Life, and the building is demolished; the Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products will be removed manually.

The End-of-Life scenario for the Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products are based industrial average for Window frame, PVC (i.e, 100% to incineration) and General sheet, aluminium (i.e. 95% recycling, 5% landfill), according to BRE EN15804 A2 PCR 3.2.
The energy used for removing the components from the final waste is considered to be negligible.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

1 meter of Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products with an average weight of 0.59 kg/m.

System boundary

This is a Cradle to Grave LCA, reporting all modules of production stage A1 to A3, Construction process stage A4 – A5, Use stage B1-B7, end of life stage C1-C4 and Module D in accordance with EN15804:2012+A2:2019 and BRE 2023 Product Category Rules (PN 514 Rev. 3.1).

Data sources, quality and allocation

The LCA analysis is conducted for 1 meter of Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products with an average weight of 0.59 kg/m, and it includes the manufacturer-specific data from Gradus covering a period of one year from 01 January 2024 to 31 December 2024.

Specific primary data derived from the Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products production process in Gradus Limited sites, Springbank, Lyme Green Business Park, Brunel Rd, Cheshire, Macclesfield SK11 0TA and Winsford, Gerflor Flooring UK Building, 16 Road One, Winsford, CW7 3QA, has been modelled using BRE LINA 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. In addition to Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products, other products are manufactured in the Gradus manufacturing sites. Altogether account for 9.2% of Springbank and 6.0% Winford's total production.

All raw material, ancillary, packaging and production waste have been taken from actual usages of site production provided by Gradus Ltd. As per energy and fuels, water and wastewater values have been allocated by mass production, considering both sites. There is no uplift of the raw material as it is within tolerance.

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.

For the Reference Service Life, Gradus Limited provides a warranty from 15 years to 20 years, depending on the product. This warranty includes manufacturing defects and excludes the failure of the double-sided tape bond. A conservative approach has been taking using the 15 years reference service life as a reference for calculations for the Replacement module.

Product	Description	Years
Wall Guard	WGS200C, WGS125C, WGA100	20
Bed Protectors	BHPA100, BHPA125	
Corner Guards	CGH, CGS, CGFLX, CGC	
Wall Guard	WGS200P, WGS125P	15
Corner Guards	CGH5090P, CGH7590P	

However, it should be noted that the service life may vary depending on the amount and nature of Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products used as well as the type and frequency of maintenance.

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).	Less than 3 years difference between the reference year according to the documentation, and the time period for which data are representative

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. 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 3 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 emission factor of 0.239kgCO2e/kWh. UK Natural gas data (at industrial furnace) was used with an emissions factor of 0.232 kgCO2eq/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, ancillary, packaging, energy and fuels, water use, and wastes are included, except for direct emissions to air, water and soil which are not measure. Upstream extraction and/or processing of inputs are included within the use of background datasets within LINA.

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	2.67E+00	2.67E+00	-2.95E-03	4.66E-03	5.95E-07	1.45E-02	9.85E-04
	Transport	A2	5.42E-02	5.41E-02	4.61E-05	2.13E-05	1.25E-08	2.21E-04	3.48E-06
	Manufacturing	A3	1.76E-01	1.71E-01	5.82E-03	1.40E-04	1.49E-08	3.55E-04	2.12E-05
	Total (Consumption grid)	A1-3	2.90E+00	2.90E+00	2.91E-03	4.83E-03	6.22E-07	1.51E-02	1.01E-03
Construction process stage	Transport	A4	6.75E-02	6.75E-02	5.75E-05	2.65E-05	1.56E-08	2.74E-04	4.35E-06
	Construction	A5	7.83E-01	7.86E-01	-3.91E-03	7.59E-04	3.00E-07	3.60E-03	2.43E-04
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	1.13E+01	1.13E+01	-2.79E-03	1.68E-02	2.82E-06	5.68E-02	3.77E-03
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
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	4.91E-03	4.90E-03	4.18E-06	1.93E-06	1.13E-09	1.99E-05	3.16E-07
	Waste processing	C3	1.00E+00	9.99E-01	3.76E-04	6.82E-05	5.13E-09	4.21E-04	1.54E-05
	Disposal	C4	3.16E-04	3.12E-04	2.82E-06	3.49E-07	3.41E-11	2.07E-06	9.21E-08
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.93E+00	-2.93E+00	4.96E-03	-3.84E-03	-9.57E-08	-1.86E-02	-9.31E-04

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 &metal	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	2.61E-03	2.67E-02	8.44E-03	3.47E-05	4.27E+01	1.37E+00	2.55E-07
	Transport	A2	6.65E-05	7.26E-04	2.22E-04	1.88E-07	8.18E-01	3.68E-03	4.67E-09
	Manufacturing	A3	1.12E-04	1.12E-03	2.89E-04	1.00E-06	3.68E+00	4.31E-02	3.14E-09
	Total (Consumption grid)	A1-3	2.79E-03	2.86E-02	8.95E-03	3.59E-05	4.72E+01	1.42E+00	2.63E-07
Construction process stage	Transport	A4	8.25E-05	9.01E-04	2.76E-04	2.35E-07	1.02E+00	4.59E-03	5.82E-09
	Construction	A5	6.87E-04	6.95E-03	2.25E-03	9.79E-06	1.64E+01	5.48E-01	3.25E-08
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	1.07E-02	1.09E-01	3.45E-02	1.38E-04	1.94E+02	5.91E+00	9.04E-07
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
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	5.99E-06	6.55E-05	2.01E-05	1.70E-08	7.41E-02	3.34E-04	4.23E-10
	Waste processing	C3	1.59E-04	1.44E-03	3.67E-04	2.04E-06	5.32E-01	6.84E-02	4.21E-09
	Disposal	C4	5.13E-07	5.52E-06	1.64E-06	6.91E-10	4.44E-03	1.41E-04	3.10E-11
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-3.08E-03	-3.21E-02	-9.21E-03	-2.47E-06	-2.79E+01	-4.16E-01	-2.32E-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	2.57E-01	6.09E+01	3.53E-09	5.28E-08	8.46E+00
	Transport	A2	4.20E-03	6.38E-01	2.07E-11	6.69E-10	5.62E-01
	Manufacturing	A3	1.04E-01	2.38E+00	6.50E-11	1.44E-09	1.30E+00
	Total (Consumption grid)	A1-3	3.65E-01	6.40E+01	3.62E-09	5.49E-08	1.03E+01
Construction process stage	Transport	A4	5.24E-03	7.96E-01	2.58E-11	8.35E-10	7.01E-01
	Construction	A5	7.46E-02	1.47E+01	5.02E-10	1.19E-08	2.85E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	1.34E+00	2.38E+02	1.24E-08	2.03E-07	4.18E+01
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	3.81E-04	5.79E-02	1.87E-12	6.07E-11	5.09E-02
	Waste processing	C3	3.91E-03	3.01E+00	1.17E-10	4.53E-09	3.88E-01
	Disposal	C4	2.59E-05	4.96E+00	2.90E-13	7.65E-12	5.68E-03
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-9.00E-02	-7.27E+01	-2.84E-09	-6.11E-08	-6.13E+00

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	3.38E+00	0.00E+00	3.38E+00	3.26E+01	9.85E+00	4.24E+01
	Transport	A2	1.15E-02	0.00E+00	1.15E-02	8.03E-01	0.00E+00	8.03E-01
	Manufacturing	A3	7.07E-01	4.67E-02	7.54E-01	3.19E+00	1.39E+00	4.58E+00
	Total (Consumption grid)	A1-3	4.09E+00	4.67E-02	4.14E+00	3.66E+01	1.12E+01	4.78E+01
Construction process stage	Transport	A4	1.44E-02	0.00E+00	1.44E-02	1.00E+00	0.00E+00	1.00E+00
	Construction	A5	9.00E-01	1.69E-03	9.01E-01	1.04E+01	5.86E+00	1.63E+01
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	1.50E+01	1.45E-01	1.52E+01	1.44E+02	5.13E+01	1.96E+02
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
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	1.04E-03	0.00E+00	1.04E-03	7.28E-02	0.00E+00	7.28E-02
	Waste processing	C3	3.69E-02	0.00E+00	3.69E-02	-1.19E+01	1.23E+01	3.83E-01
	Disposal	C4	2.87E-04	0.00E+00	2.87E-04	4.40E-03	0.00E+00	4.40E-03
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.01E+00	0.00E+00	-2.01E+00	-2.77E+01	0.00E+00	-2.77E+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	5.17E-02	0.00E+00	0.00E+00	3.35E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	9.11E-05
	Manufacturing	A3	4.45E-04	2.68E-06	0.00E+00	1.52E-03
	Total (Consumption grid)	A1-3	5.21E-02	2.68E-06	0.00E+00	3.51E-02
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	1.14E-04
	Construction	A5	2.97E-03	0.00E+00	0.00E+00	1.31E-02
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	1.65E-01	8.03E-06	0.00E+00	1.45E-01
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
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	8.26E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	1.61E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	3.40E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-1.10E-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	1.04E-01	2.24E+00	4.66E-05
	Transport	A2	9.02E-04	1.60E-02	5.53E-06
	Manufacturing	A3	8.23E-03	1.04E-01	2.76E-05
	Total (Consumption grid)	A1-3	1.13E-01	2.36E+00	7.98E-05
Construction process stage	Transport	A4	1.12E-03	2.00E-02	6.90E-06
	Construction	A5	5.75E-02	1.11E+00	2.58E-05
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	5.15E-01	1.05E+01	3.39E-04
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	8.17E-05	1.45E-03	5.02E-07
	Waste processing	C3	1.78E-02	4.94E-01	1.23E-06
	Disposal	C4	1.22E-04	8.72E-03	1.76E-08
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.49E-01	-4.13E+00	-4.53E-05

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
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	2.99E-02	4.97E-03	2.16E-03
	Total (Consumption grid)	A1-3	0.00E+00	2.99E-02	4.97E-03	2.16E-03
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	1.95E-04	2.85E-03	0.00E+00
Use stage	Use	B1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Maintenance	B2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Repair	B3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Replacement	B4	0.00E+00	9.04E-02	2.35E-02	6.47E-03
	Refurbishment	B5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational energy use	B6	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Operational water use	B7	0.00E+00	0.00E+00	0.00E+00	0.00E+00
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	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	3.04E+00
	Disposal	C4	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

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Biogenic carbon (product)	Biogenic carbon (packaging)
kg C	kg C
0.00E+00	6.18E-04

Scenarios and additional technical information

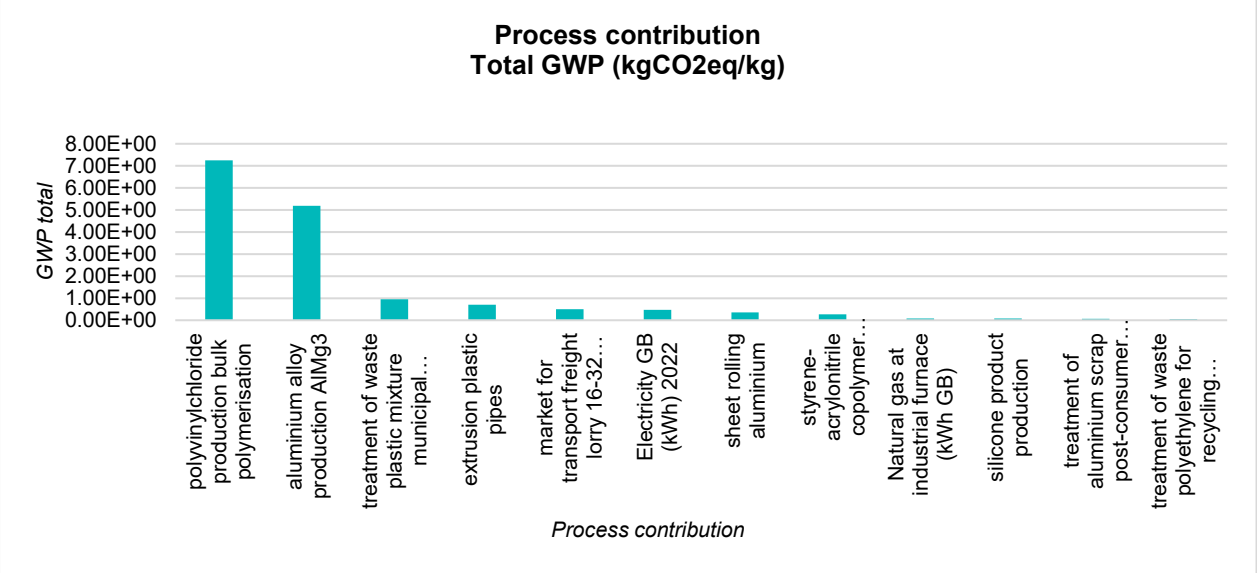
Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	All Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products are transported using Gradus transport. Lorries are loaded and make multiple drop-offs on their route. When needed, the same lorries are used to carry raw material from suppliers, depending on the route.		
	Vehicle type	Litre of fuel type per distance or vehicle type	Lorry, 16 -32 metric ton
	Distance:	km	688
	Capacity utilisation (incl. empty returns)	%	50
A5 – Installation in the building	All Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products come as precut section and no trimming or cutting would be needed at the job site. The only installation waste produce is the one cause by the packaging of the product.		
	Installation wastage rate	%	0
B1 - Use	Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products are installed to provide wall protection.		
B2 – Maintenance	Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products only require general cleaning. No ancillary materials, energy and/or water is needed during this process.		
B3 – Repair	No repairs are carried out for Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products.		
B4 – Replacement	If a section of Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products is damaged, the section is removed and a new section fitted in its place. The replacement of the product is more likely to occur once it reaches the end of its service life, which typically occurs after 15 years.		
	Number of replacements per study period	Qty	3
B5 – Refurbishment	No refurbishment is carried out for Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products.		
Reference service life	Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products service life of 15 to 20 years. This service life is based on the Wall Guards warranty period, and it includes manufacturing defects and excludes failure of the double-sided tape bond.		
	Wall protection warranty. Gradus. 2023.	years	15-20
B6 – Use of energy	No operational energy needed.		
B7 – Use of water	No operational water needed.		
C1 – Deconstruction	When Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products reach the End-of-Life, they will be manually removed and sent to a waste processing facility. It is assumed that 100% of the product is recovered for final disposal.		
C2 - Transport	50km by road has been modelled for module C2 as a typical distance from the demolition site to the recycling/ landfill unit. However, end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module C2 if required.		
	Road transport	km	50
C3 - Preprocessing	Once Wall Guards, Wall Strips & Bed Head Protectors and Corner Guards products reach the End-of-Life, they will be sent to the waste processing facility. The industrial End-of-Life scenario has been selected for Polypropylene, Window frame, PVC. Ie. 100% Incineration with energy recovery; and General sheet, aluminium. i.e 95% recycling, 5% landfill. The End-of-Life scenario is based on BRE 2025 Product Category rules (PN 514 Rev 3.2)		

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
	PVC to incineration with energy recovery	kg	0.40
	Aluminium to recycling facility	kg	0.16
C4 - Disposal	Aluminium to landfill	kg	0.008
Module D	“Benefits and loads beyond the system boundary” (module D) accounts for the environmental benefits and loads resulting from PVC and Aluminium that are used as raw material in Handrail products, and that are collected for incineration and recycling at the end-of-life. These benefits and loads are calculated by excluding the pre-existing recycled aluminium that is used in the primary process, and it is considered that 100% of the PVC will be incinerated. For the benefits arising from incineration, the calorific value of Polyvinyl Chloride (PVC) has been considered, based on the Combustion and Gasification Properties of Plastics Particles (https://doi.org/10.1080/10473289.1997.10464461). The efficiency rate of 37.4% has been calculated by taking the weighted average of the number of waste incineration plants available in the UK. According to the Environmental Agency's 2013 article on "CHP Ready Guidance for Combustion and Energy from Waste Power Plants" in the UK, EFW plants have an efficiency of 33%, and CHP plants have an efficiency of 55%. Additionally, according to Azapagic, A., & Jeswani, H. K. (2016), there are currently 25 MSW incinerators with energy recovery in the UK. It is assumed that 20 plants generate heat and power at 33%, while 5 plants generate electricity at 55%. Therefore, the weighted average calculation is used to determine the efficiency, which is calculated at 37.5%.) The calculation includes a bespoke dataset for heat and electricity. The dataset used to calculate the avoided impacts of heat and electricity consumption in a future system was ‘Heat, district or industrial, other than natural gas {Europe without Switzerland}| market for heat, district or industrial, other than natural gas	EN15804, U’, ‘Heat, district or industrial, natural gas {Europe without Switzerland}| market for heat, district or industrial, natural gas	EN15804, U. ‘, ‘Electricity, high voltage {Europe without Switzerland}| market group for electricity, high voltage	EN15804, U’ all of them are from 2021. Calorific value of PVC: 21.2MJ/kg		
	Benefits due to the incineration of waste PVC	Kg	0.40
	Benefits due to recycling of Aluminium	Kg	0.12

Interpretation of results

The bulk of environmental impacts are attributed to the Product Module covered by information modules A1-A3 of EN 15804:2012+A2:2019. i.e Raw material supply. The GWP total for A1 is 2.67E+00 kg CO2 eq.

The GWP Total process contribution can be found in the table below and it show that the major contributor is polyvinylchloride production bulk polymerisation by 55.30%.



References

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A1:2013. London, BSI, 2013.

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.