

*In accordance with ISO14025 and EN 15804+A2:2019 for:
Aluminium windows and doors from APL Window Solutions*

Environmental Product DECLARATION v1.1

Programme:

The International EPD[®] System
www.envirodec.com

Programme operator:

EPD Australasia Limited
www.epd-australasia.com

EPD registration number:

S-P-07452

Publication date:

Publication date: 2023-05-24
Version date: 2023-11-08
Valid until: 2028-05-24

Geographical scope of EPD:

New Zealand

About this EPD

An Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules).

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable.

The results for EN15804+A1 compliant EPDs are not comparable with EN15804+A2 compliant studies as the methodologies are different. Results that are EN15804+A1 compliant are given in an annex to this document to assist comparability across EPDs.




<p>Declaration owner:</p> 	<p>APL Window Solutions Web: https://www.aplnz.co.nz/ Email: marketing@aplnz.co.nz Post: 19 Northpark Drive, Hamilton 3241, New Zealand</p>
Geographical Scope	New Zealand
Reference Year for Data	01 July 2020 - 30 June 2021
<p>EPD produced by:</p> 	<p>thinkstep Ltd Web: http://www.thinkstep-anz.com Email: anz@thinkstep-anz.com Post: 11 Rawhiti Road, Pukerua Bay, Wellington 5026, New Zealand</p>
<p>EPD programme operator:</p> 	<p>EPD Australasia Limited Web: http://www.epd-australasia.com Email: info@epd-australasia.com Post: EPD Australasia Limited, 315a Hardy Street Nelson 7010, New Zealand</p>
CEN standard EN 15804+A2 served as the core PCR	
PCR:	PCR 2019:14 Construction Products v1.11 and C-PCR-007 (to PCR 2019:14) Windows and Doors (EN 17213:2020)
PCR review was conducted by:	The Technical Committee of the International EPD® System
Chair:	Claudia A. Peña. Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025:	<input type="checkbox"/> EPD process certification (Internal) <input checked="" type="checkbox"/> EPD verification (External)
Third party verifier:	John Andrews Toitū Envirocare John.Andrews@toitu.co.nz
Verifier approved by:	EPD Australasia
Procedure for follow-up of data during EPD validity involved third-party verifier	No
Version History	1.1 Correction to the LCA modelling - Update to the results tables in pages 36-55 and Annex

Table of Contents

About this EPD	2
Raising the Profile of Manufacturing in Aotearoa	4
Our Integrated Supply Chain Of Businesses	6
Our Responsibility	8
Nationwide	10
Residential Series ThermalHEART®	14
Metro Series ThermalHEART®	17
Commercial Series	20
Product Life Cycle	24
Industry Classification	26
System Boundary	27
Assessment Indicators	32
Environmental Performance	36
References	56
Annex	58



Raising the Profile of Manufacturing in Aotearoa

50 Years Young

APL Window Solutions (APL) is the largest window solutions organisation in New Zealand and has been proudly family-owned and NZ Made for over 50 years. We've grown alongside our manufacturers to bring quality architecture and building to every corner of the country.

Since 1971, APL have been successfully designing, developing, testing and manufacturing window and door systems for our three brands: Altherm Window Systems, First Windows & Doors and Vantage Windows & Doors.





New Zealand Made

We take huge pride in our track record of supplying window and door solutions for New Zealand home and building owners. Everything we manufacture is designed and tested specifically for New Zealand conditions.

Our Centre of Innovation houses our dedicated research, development and testing facility where our products are developed for our country's unique landscape, coastlines, weather patterns and design aesthetics. Part of our commitment to designing for New Zealand is designing and operating in a way that reduces our environmental footprint.

Our Partners

We supply independently-owned [manufacturers](#), all over the country, as well as in some areas of the South Pacific. These dedicated operators work on a wide variety of residential and commercial projects and are the exclusive suppliers of APL products through our three brands: [Altherm](#), [First](#) and [Vantage](#). They share our commitment to excellence and our spirit of innovation.

Proudly part of the Profile Group of businesses

APL is proudly part of the Profile Group of businesses. Profile Group represents a family of businesses that together form New Zealand's only integrated supply chain for aluminium window and door solutions.

The key to keeping things simple is to keep them seamless – the one-stop-shop approach. As we've grown, we've developed an end-to-end service for our customers that covers every major step in the process, from extruding the aluminium to delivering our systems and parts directly to manufacturers all over New Zealand. Our eco-system of businesses work together to shape a better future for all.



Our Integrated Supply Chain Of Businesses



INEX (Independent Extrusions) is the largest extruder of aluminium in New Zealand, supplying aluminium for approximately 70% of New Zealand's windows and doors. INEX is the first step within our group's end-to-end operations.



Colour Works has three powdercoat lines and is continuously exploring new methods of coating aluminum extrusion for NZ. These powdercoat lines are designed as a seamless step within the group's manufacturing processes.



Finishing Excellence (FINEX) is our on-site anodising plant and is the most modern facility of its kind in New Zealand. Ensuring the highest finishing quality in all our window and door solutions made for New Zealand.



APL Window Solutions (APL) is NZ's largest window solutions organisation – known for high quality products that are designed, developed, tested, and manufactured in, and specifically for NZ buildings and conditions. APL serves our fabricator network with Altherm, First and Vantage Windows & Doors product.



APL Manufacturing houses NZ's largest Aluminium Entrance Door manufacturing unit, extensive priority hardware assembly and a wide range of CNC fabricated accessory products. Essential for manufacturing the industry's niche product for APL customers.



PPL Plastic Solutions specialise in the design and manufacturing of both flexible and rigid profile extrusions, and injection moulded parts, supplying a variety of market sectors. PPL solutions are used in products across the group, and in our reusable packaging systems.



Architectural Glass Products (AGP) is a state of the art, double-glazing manufacturing business, created to complete the end-to-end supply chain solutions within Profile's Group. Glass is integral to any window solution and AGP enables us to offer the most advanced glass technology.



APL Direct maintains a fleet of purpose-designed trucks with the highest of environmental standards and optimised management. APL Direct distributes all product and componentry to our networks across the country on behalf of Profile Group's businesses.



Together - we design, make and deliver end - to - end solutions for New Zealand environments.



Our Responsibility

Reducing our impact on the environment and our communities is right at the heart of what drives us and our ambition for the future. We're on a journey to reimagine how we can improve this in every way.

Because we know the choices we make today, directly impact the future of our environments tomorrow.



99.9%

unused aluminium is recycled back at smelter



we have a chromate free powder coating process



-203,520m

Reusable pallet cover solution - eliminating 1.5tons of plastic wrap from landfill annually (reductions occur from 2022).

-70%

We have eliminated 70% of plastic wrap from our packaging, using paper alternative



>800,000



Takapoto Estate (another Profile Group subsidiary company and carbon offset venture) have planted over 800,000 native trees across the Waikato to date. A further 40k trees have been planted as part of our staff restoration projects

96% of our fleet is rated Euro 5 or better and 55% of our fleet is now rated Euro 6 - the highest rating available for exhaust emissions



Profile Group acquires renewable energy certificates from Kawatiri Energy making the groups electricity usage carbon neutral. This further cements the company's investment to lock in the collaboration by taking up a shareholding in Kawatiri Energy

Profile Groups partnership with Sanctuary Mountain Maungatuatari enables an NZ first with the issue and purchase of Biodiversity Units to enhance conservation management.





We're making the shift towards a circular economy

Nearly half of the world's total emissions are a consequence of the linear way we make, use and dispose of materials and products and less than 9% of the resources we use to build the world around us are cycled back for reuse. As industry leaders and innovators, we have both the opportunity and responsibility to address the rising need for large-scale, sustainable change. For us, this starts at the design stage or as we like to think of it now, the redesign stage. We're closing the loop on material flows, designing waste and pollution out of our system and with our commitment to regenerating our natural environments we aim to put product in to your home or building that has made zero impact on our beautiful country.

A more measured existence is a commitment to leaving the world better than we found it

You can't manage what you don't measure so we have teamed up with organisations and tool providers like ThinkStep-anz and Toitū Envirocare to understand the life cycle of our products and our footprint, Circular IQ for the use of their Circular Transition Indicator (CTI) tool to improve our circular performance as well as becoming Declared through the International Living Future Institute. Measuring as many aspects of our business as we can to understand, track and prove progress on our environmental targets has become key for us and something we are pretty proud of.

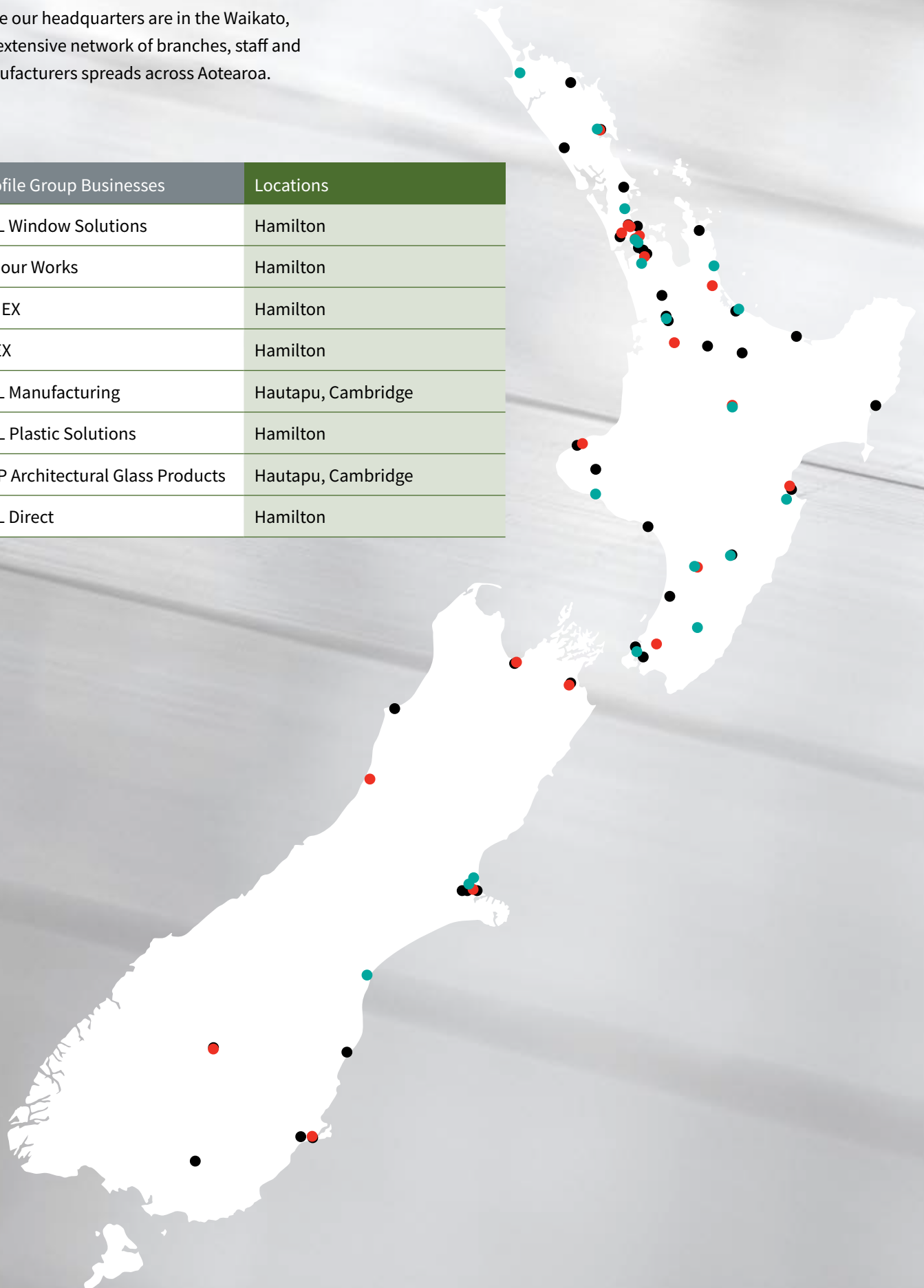


We're always looking forward & always improving today for the future of the environments we shape, share, make and live in.

Nationwide

While our headquarters are in the Waikato, our extensive network of branches, staff and manufacturers spreads across Aotearoa.

Profile Group Businesses	Locations
APL Window Solutions	Hamilton
Colour Works	Hamilton
FINEX	Hamilton
INEX	Hamilton
APL Manufacturing	Hautapu, Cambridge
PPL Plastic Solutions	Hamilton
AGP Architectural Glass Products	Hautapu, Cambridge
APL Direct	Hamilton





Fabricator Businesses	Location
Aitken Joinery	Gore
Alutech Windows & Doors	Sockburn
Ascot Aluminium	Wiri
Bay Aluminium	Kerikeri
Central Aluminium	Stratford
Composite Joinery	Warkworth
Counties Aluminium	Papakura
Danevirke Glass & Aluminium	Dannevirke
Dargaville Aluminium & Glass	Dargaville
Design Windows Vantage	Christchurch
Envision Aluminium	Blenheim
Evolution Windows Ltd	Lower Hutt
Glenns Glass & Aluminium	Whakatane
Glenns Glass Rotorua	Rotorua
Hagley Windows And Doors	Christchurch
Hopkins Joinery	Putaruru
Huntly Joinery Window Systems	Huntly
Insite	Nelson
Lancer Aluminium Limited Partnership	Henderson
ICM Aluminium Ltd	Henderson
Metro Windows And Doors Levin	Levin
Monarch Aluminium	Woolston
Nichol Glass & Aluminium	Greenmeadows
NZ Windows Coromandel	Whitianga
NZ Windows Hamilton	Hamilton
NZ Windows Tauranga	Tauranga
NZ Windows Wellington	Porirua
Phoenix Windows & Doors	Whangarei
Regal Aluminium	Frankton
Reids Joinery	Mosgiel
Seymour Windows & Doors Ltd	New Plymouth
Summit Windows & Doors Ltd	Wiri
TRT Builders	Westport
Vantage Windows	Glenfield
Vantage Aluminium Oamaru	Oamaru
Vision Windows	Takanini
Wight Aluminium	Whanganui



Fabricator Businesses	Location
Altherm Canterbury	Christchurch
Alitech Residential	Waihi
Alitech Architectural	Waihi
Altherm Window Systems	Palmerston North
Altherm Napier	Napier
Altherm Aluminium Northland 2018 Ltd	Whangarei
Altherm Taranaki	New Plymouth
Altherm West Joinery	Henderson
Apex Windows	Taupo
Dawson Aluminium	Blenheim
Door & Window Systems Auckland Ltd	Penrose
Design Windows Central	Cromwell
Design Windows Nelson	Stoke
Design Windows West Coast	Greymouth
NT Joinery Ltd	Te Awamutu
Phoenix Windows & Doors	Auckland
Phoenix Windows & Doors	Auckland
Premier Aluminium	Drury
Westview Aluminium	Upper Hutt



Fabricator Businesses	Location
Aluminium City	Penrose
Bernie Walsh Aluminium	Dannevirke
CBD Windows And Doors Ltd	Penrose
Epic Aluminium	Mt Maunganui
Franklin Aluminium	Pukekohe
First Christchurch Windows & Doors	Papanui
Arthur Brown Construction	Hawera
First Windows Taupo	Taupo
First Windows & Doors	Whangamata
Hollings First Aluminium	Masterton
Kaiapoi Aluminium	Belfast
Kaitaia Glass & Aluminium	Kaitaia
Kennedy Aluminium	Timaru
Metro Windows And Doors	Palmerston North
North Shore Joinery Ltd	Silverdale
Wight Aluminium Waikato	Te Rapa
Twin City Aluminium	Napier
Whangarei Aluminium	Whangarei
Wellington Windows & Doors	Porirua
Windowmakers	Silverdale



ThermalHeart⁺

Product Information

This Environmental Product Declaration covers a total of 16 APL aluminium windows and doors assembled from extruded coated/anodised aluminium profiles with thermal breaks.

These products span across three product ranges:

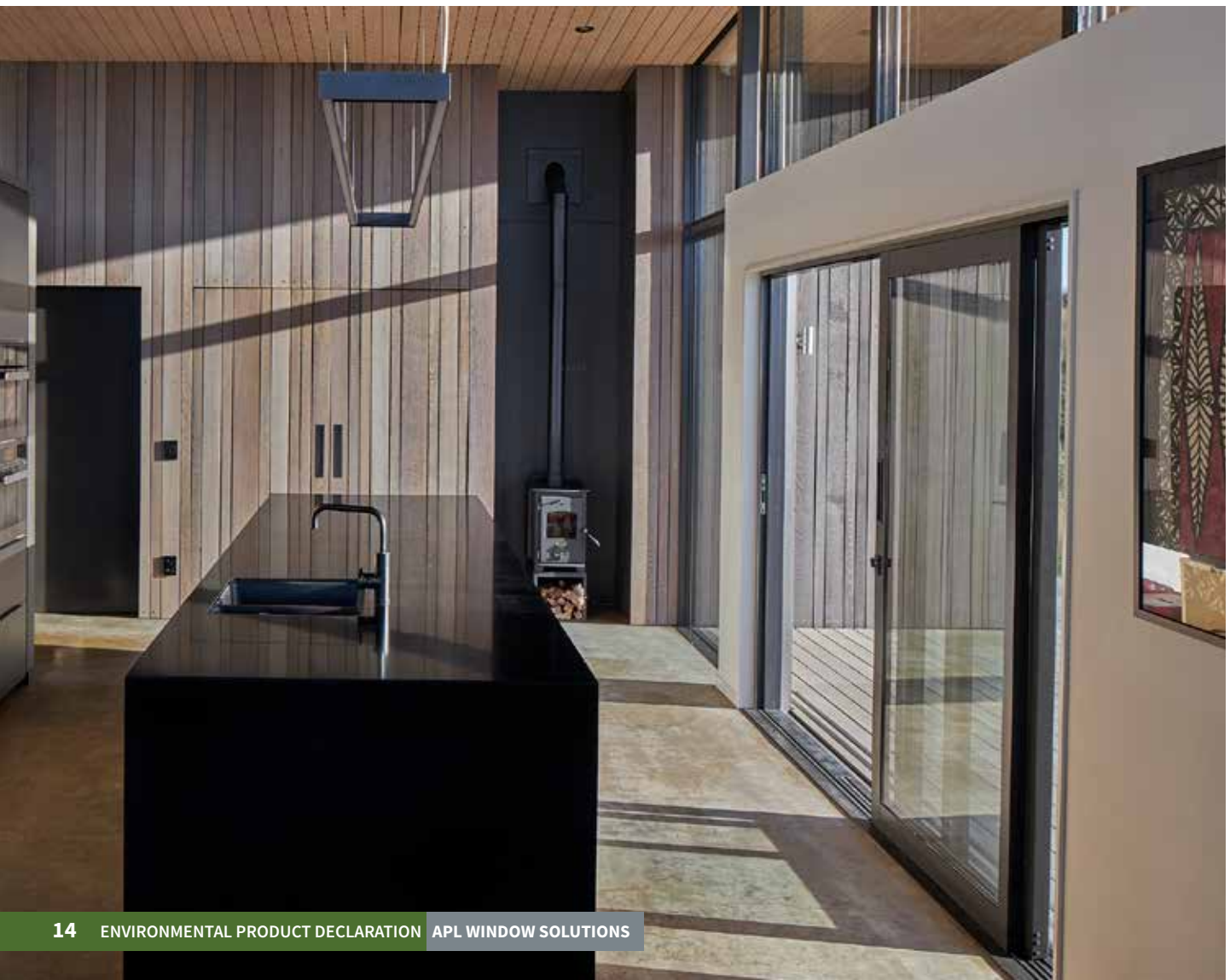
- Residential Series ThermalHEART®
- Metro Series ThermalHEART®
- Commercial Series

The following subsections provide more details of each product range.



Residential Series ThermalHEART®

APL's Residential Series ThermalHEART® is a mainstream suite of thermally efficient windows and doors suitable for a range of residential projects. A polyamide insulator is included in every ThermalHEART® extrusion which acts as a thermal break. The Series contains a full product portfolio including awning, sliding, and bi-folding windows, as well as sliding, hinged, and bi-folding doors.





Awning and Casement Windows

Specifications

Dimensions

Awnings 1400mm high x 1000mm wide; casements 1400mm high x 800mm wide. May be restricted by weight and wind zones

Maximum Glass Thickness

24mm IGU as standard, but 32mm IGU possible

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

Performance

Tested to Extra High wind zone



Sliding Windows

Specifications

Dimensions

Recommended maximum 1800mm high x 1500mm wide panels in Extra High wind zones. For larger panels consult your window manufacturer

Maximum Glass Thickness

24mm IGU as standard, but 32mm IGU can be used with a wedged bead

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

Performance

Tested to Extra High wind zone



Bi-fold Windows

Specifications

Dimensions

Recommended maximum panels of 1800mm high and 900mm wide

Maximum Glass Thickness

24mm IGU as standard, but 32mm IGU can be used with a wedged bead

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

Performance

Tested to Extra High wind zone

Sliding Doors

Specifications

Dimensions

Recommended maximum panels of 2200mm high and 1500mm wide

Maximum Glass Thickness

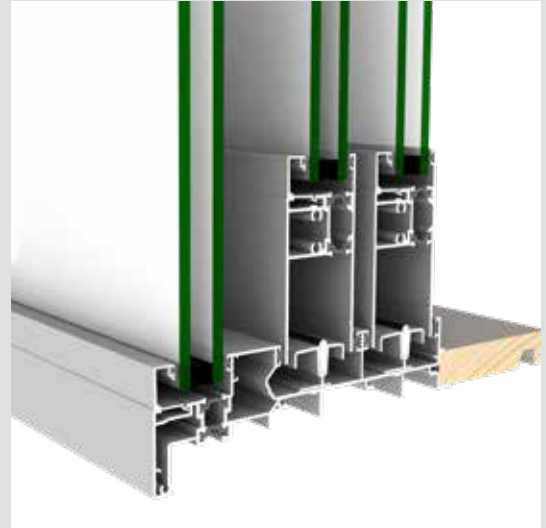
24mm IGU as standard, but 32mm IGU can be used with a wedged bead

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

Performance

Tested to Extra High wind zone



Hinged and French Doors

Specifications

Dimensions

Recommended maximum panels of 2200mm high and 900mm wide

Maximum Glass Thickness

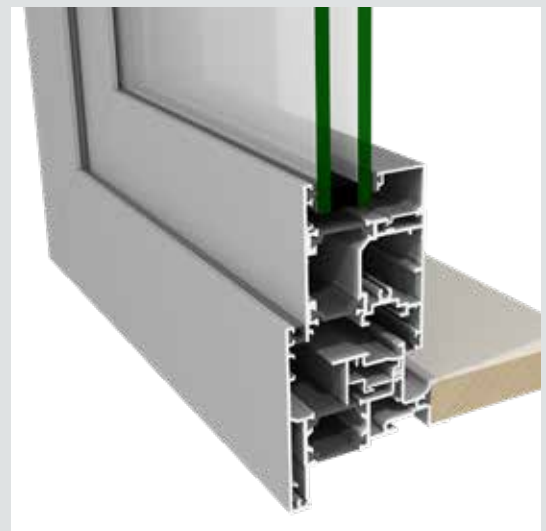
24mm IGU as standard, but 32mm IGU can be used with a wedged bead

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

Performance

Tested to Extra High wind zone



Bi-fold Doors

Specifications

Dimensions

Recommended maximum panels of 2200mm high x 900mm wide

Maximum Glass Thickness

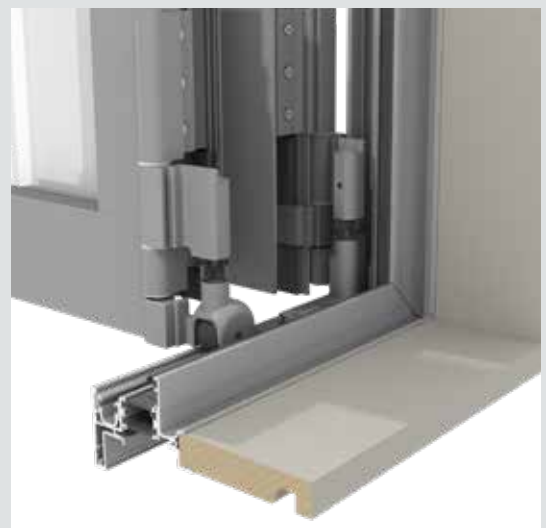
24mm IGU as standard, but 32mm IGU can be used with a wedged bead

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

Performance

Tested to Extra High wind zone



Metro Series ThermalHEART®

APL's Metro Series ThermalHEART® is a thermally efficient range of windows and doors suitable for large residential projects. A polyamide insulator is included in every ThermalHEART® extrusion which acts as a thermal break. The Series contains a full product portfolio including awning, sliding, and bi-folding windows, as well as sliding, hinged, and bi-folding doors.



Awning and Casement Windows

Specifications

Dimensions

Awning and casement windows have a recommended size of 1400 mm high x 800mm wide

Maximum Glass Thickness

44mm IGU

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.1.

Performance

Tested to Extra High wind zone



Sliding Windows

Specifications

Dimensions

Metro Series ThermalHEART® sliding windows can be made to large door-size panels if needed, because they are based on the sliding door system. Panels 2000mm high x 1500mm wide would conform

Maximum Glass Thickness

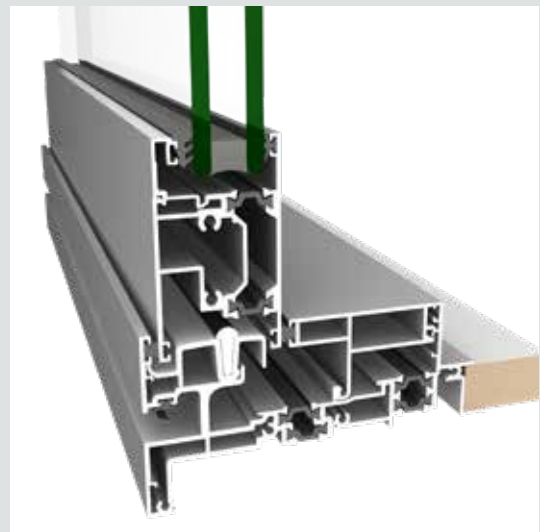
44mm IGU

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

Performance

Tested to Extra High wind zone



Bi-fold Windows

Specifications

Dimensions

Because they use the bi-fold door system, windows can be built to tall heights with a recommended panel size of 2000mm high by 900mm wide

Maximum Glass Thickness

44mm IGU

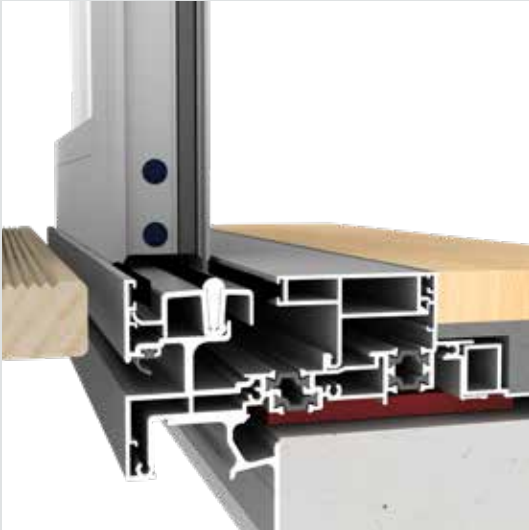
Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

Performance

Tested to Extra High wind zone





Sliding Doors

Specifications

Dimensions

Recommended maximum panels of 2700mm high by 1500mm wide

Maximum Glass Thickness

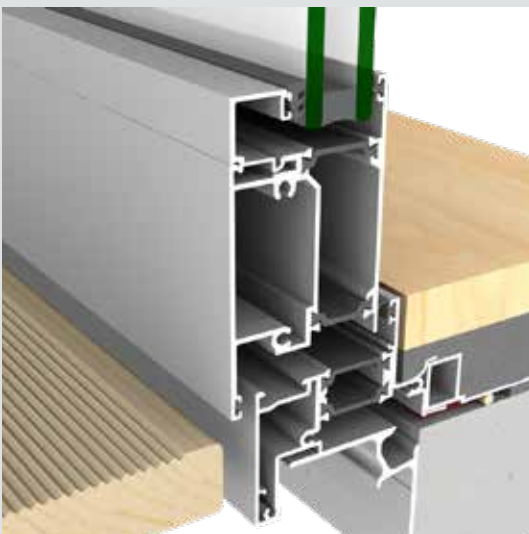
44mm IGU

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

Performance

Tested to Extra High wind zone



Hinged and French Doors

Specifications

Dimensions

Recommended maximum panels of 2700mm high and 900mm wide

Maximum Glass Thickness

44mm IGU

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

Performance

Tested to Extra High wind zone



Bi-fold Doors

Specifications

Dimensions

Recommended maximum panels of 2700mm high by 900mm wide

Maximum Glass Thickness

44mm IGU

Thermal Values

Complies with the Construction R-values provided in NZBC clause H1, Appendix E, table E1.1.1.

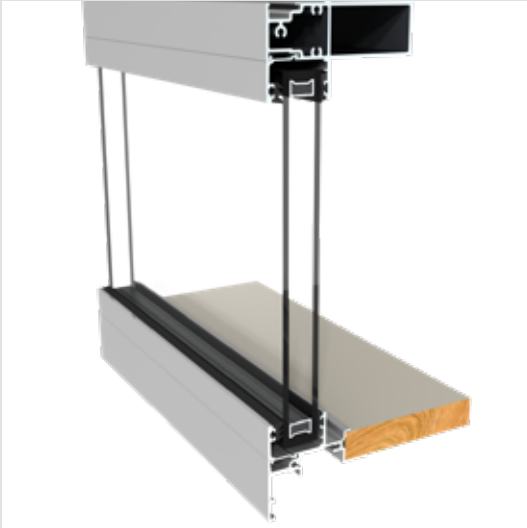
Performance

Tested to Extra High wind zone

Commercial Series

APL's Commercial Series is a range of windows and doors suitable for commercial buildings. The Series covers window systems for low-rise to high-rise buildings and door systems for a wide variety of entranceway's.





40mm Window Series

Specifications

Dimensions

Awning windows up to 1600mm high x 1000mm wide, casements 1600mm high x 800mm wide (larger possible depending on width, height, weight and hardware)

Maximum Glass Thickness

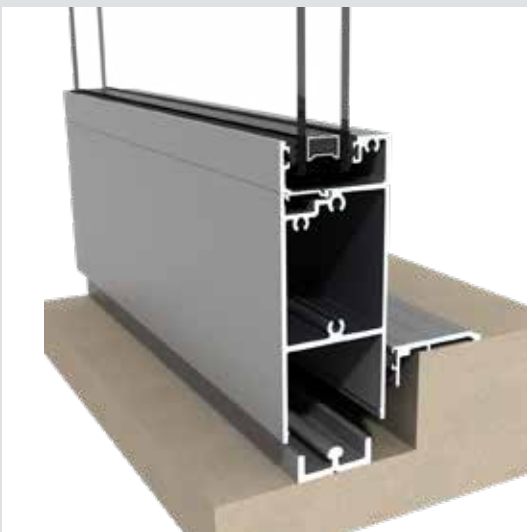
28mm IGU

Thermal Values

Consult APL Technical Department

Performance

Tested to Extra High / Specific Design wind zones.
Projects may require project specific testing



Magnum Commercial Doors

Specifications

Dimensions

Sliding doors recommended maximum panels 2700mm high and 2400mm wide. Hinged doors recommended maximum panels 2700mm high and 1000mm wide

Maximum Glass Thickness

27mm IGU

Thermal Values

Consult APL Technical Department

Performance

Tested to Extra High wind zones



Table 1: Product specifications

Product range	Product	Standard size (m ²)	Mass (kg/m ²)
Residential Series ThermalHEART®	Awning Window	1.23 x 1.48	23.0
	Sliding Window	1.23 x 1.48	30.1
	Bi-fold Window	1.23 x 1.48	26.2
	Sliding Door	1.23 x 2.18	28.2
	Hinged Door	1.23 x 2.18	22.4
	French Door	1.23 x 2.18	22.5
	Bi-fold Door	1.23 x 2.18	22.7
Metro Series ThermalHEART®	Awning Window	1.23 x 1.48	23.1
	Sliding Window	1.23 x 1.48	29.8
	Bi-fold Window	1.23 x 1.48	28.9
	Sliding Door	1.23 x 2.18	29.1
	Hinged Door	1.23 x 2.18	24.2
	French Door	1.23 x 2.18	25.0
	Bi-fold Door	1.23 x 2.18	25.4
Commercial Series	Awning Window	1.23 x 1.48	23.0
	Hinged Door	1.23 x 2.18	23.7

APL windows and doors are manufactured in accordance with the UN CPC product group, ANZSIC 2006 code, and the relevant standards for New Zealand Building Codes and relevant New Zealand standards.

Product Life Cycle

This is a 'cradle-to-gate' type EPD with Modules C1–C4 and Module D added. This means that the production (Modules A1–A3), end-of-life (C1–C4) and recovery (D) stages are modeled in this EPD. The installation processes (Modules A4–A5) and use stages (Modules B1–B7) are not modeled.

The production stage involves the extraction of all raw materials, transport to the APL production facility, and the manufacturing of these materials to make windows and doors ready to be distributed to customers (gate). The end-of-life stage includes demolition/deconstruction of the building, transport of wastes, and treatment of wastes.

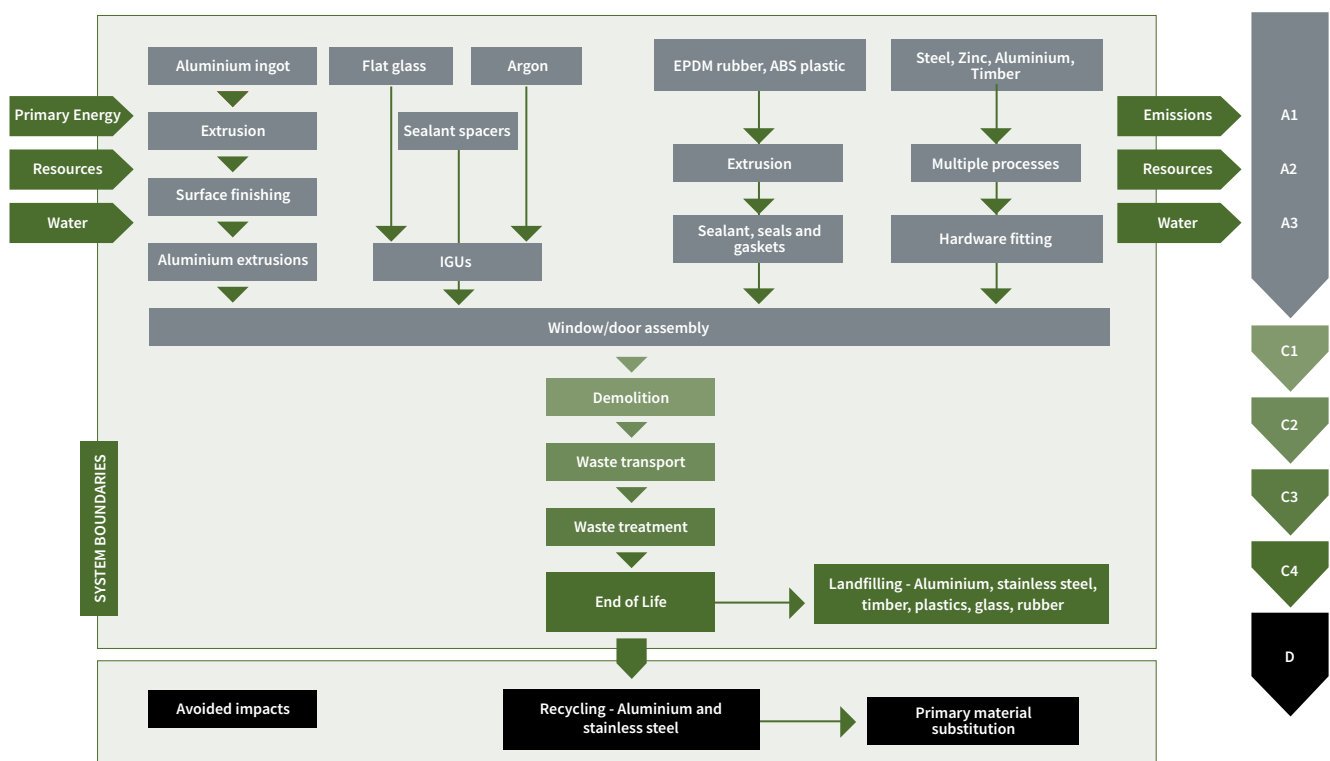


Figure 1: Life cycle stages of APL windows and door

Product Composition

The windows and doors declared in this EPD are made from an aluminium extrusion frame, enclosing. The composition of APL windows and doors is in Table 2, as per EN15804 requirements.

None of the materials in this EPD are on the Candidate List of substances of very high concern (SVHC), by the European REACH Regulation at a concentration greater than 0.1% by mass.

Table 2 Product composition, per m² of window or door

Component	Chemical Substances	Metro Thermal Door	Metro Thermal Window	Residential Thermal Door	Residential Thermal Window	Commercial Door	Commercial Window	CAS number
Extrusion								
Profile extrusion	Aluminium	29.4%	29.4%	24.9%	24.9%	35.5%	28.2%	7429-90-5
Glass								
Float glass		49.6%	49.6%	53.3%	53.3%	53.5%	62.9%	
Spacer material	Polyisobutylene Base	1.87%	1.87%	2.01%	2.01%	2.01%	2.37%	9003-27-4
Secondary sealant	Polysulphide Base	1.87%	1.87%	2.01%	2.01%	2.01%	2.37%	
Hardware fittings								
Hardware and handles	Alloy of Zinc, Aluminium, Magnesium, Copper	0.59%	0.59%	0.60%	0.60%	2.53%	-	
Hardware, handles, staples	Zinc	1.37%	1.37%	1.41%	1.41%	0.07%	-	7440-66-6
Hardware, handles, screws	316 Stainless Steel	0.53%	0.53%	0.54%	0.54%	1.39%	0.48%	
Hardware (Ticona CELCON M90 CD3068 BLACK)	Acetyl co-polymer	0.02%	0.02%	0.02%	0.02%	-	-	24969-26-4
Hardware componentry	Nylon 6	0.21%	0.21%	0.21%	0.21%	-	-	32131-17-2
Seals and gaskets (setting blocks)	Thermoplastic Elastomer	0.95%	0.95%	0.97%	0.97%	0.14%	-	308079-71-2
Seals and Gaskets (glazing rubber)	EPDM	0.04%	0.04%	0.04%	0.04%	0.64%	2.13%	25038-36-2
Thermal break strip	Polyamide 66	-	-	-	-	-	-	32131-17-2
Joint sealant - Toptec sealer (Acrylflex)	Toulene	-	-	-	-	0.37%	0.09%	108-88-3
	White Spirits	-	-	-	-	-	-	64742-82-1
Liners								
Liners	Timber	-	-	11.7%	11.7%	-	-	NZ Sourced
Liners	Aluminium	11.1%	11.1%	-	-	-	-	7429-90-5
Surface Finish								
Powder coat		2.33%	2.33%	2.12%	2.12%	1.70%	1.34%	
Anodise		0.12%	0.12%	0.10%	0.10%	0.15%	0.12%	
Total product		100%	100%	100%	100%	100%	100%	

Table 3: Packaging per m² of window or door

Material / chemical substances	Metro Thermal Door	Metro Thermal Window	Residential Thermal Door	Residential Thermal Window	Commercial Door	Commercial Window
Cases Bases (Wood)	0.8239	0.5692	0.6685	0.6593	0.8182	0.4327
Cleats various (Wood)	0.6012	0.4153	0.4878	0.4810	0.5970	0.3157
Cardboard	0.4949	0.3419	0.4016	0.3960	0.4915	0.2599
Foam Roll 1200mm wide 0.7 or 1.5mm thick 300m long	0.0641	0.0443	0.0520	0.0513	0.0637	0.0337
Steel strapping	0.0717	0.0495	0.0581	0.0573	0.0712	0.0376
Newsprint Roll 1200mm x 40gsm x 400m	0.0403	0.0278	0.0327	0.0322	0.0400	0.0211
Polystyrene Blocks 0.4x0.110x0.020m	0.0323	0.0223	0.0262	0.0258	0.0321	0.0170
Hand Bundle Wrap	0.0158	0.0109	0.0128	0.0126	0.0156	0.0083
Spiral wrap film	0.0111	0.0076	0.0090	0.0089	0.0110	0.0058
Bubblewrap Wraps 0.5x0.075m	0.0028	0.0019	0.0023	0.0023	0.0028	0.0015
Direct Thermal Labels roll of 750 labels	0.0025	0.0017	0.0020	0.0020	0.0025	0.0013
Chemical Resistant Labels roll of 1000 labels	0.0002	0.0001	0.0001	0.0001	0.0002	0.0001
Orange Chem Resistant Labels-Perfed	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000
Total	2.16	1.50	1.75	1.73	2.15	1.13

Industry Classification

Table 4: Industry classification of products included in this EPD

Product	Classification	Code	Category
Residential and Architectural Windows and doors	UN CPC Ver.2.1	42120	Doors, windows and their frames and thresholds for doors, of iron, steel or aluminium
	ANZSIC 2006	C2223	Architectural Aluminium Product Manufacturing Aluminium framed window manufacturing complete with glass Aluminium framed door, glazed, manufacturing

Declared Unit

EPDs that do not cover the full product life cycle from raw material extraction through to end-of-life use the term “declared unit”, rather than functional unit. “Declared unit” will be used in the EPDs themselves and is defined as: 1 m² of window or door, normalised from standard window sizes.

System Boundary

In Life Cycle Assessment (LCA), the system boundary is a line that divides the processes which are included from everything else. The system boundary of this EPD includes production (‘cradle-to-gate’, Modules A1-A3), end-of-life (Modules C1-C4) and the recovery potential of the window/door materials (Module D) - as illustrated in Table 5 below.

Production (Modules A1-A3)

Aluminium extrusion profiles are processed from aluminium ingot from the Tiwai Smelter in Southland (New Zealand), using hydraulic extruders. These extrusions undergo a surface finishing process, which can be either powder coating or anodising.

Insulated glass units (IGUs) are manufactured by Architecture Glass Products (AGP) - a New Zealand-based supplier, who manufactures IGUs using imported glasses from Indonesia and Belgium. Hardware fittings (such as hinges, handles, screws), gaskets/seals, and sealants required for the final window/door assembly are sourced from a mix of New Zealand and overseas manufacturers - mainly from China and Taiwan.

All these components - aluminium extrusions, IGUs, hardware fittings, gaskets/seals, and sealants, are then distributed to fabricators across New Zealand and in the South Pacific (Fiji, Rarotonga, Samoa, and Tahiti), through individual distribution networks. Once there, the extrusions are fitted with IGUs and other hardware fittings to form a full window/door assembly, which is installed into residential and commercial buildings.

Modules A1-A3 represent the manufacturing and packaging of aluminium extrusion profiles (including extraction and processing of raw materials and the transport to manufacturing site), manufacturing of the rest of the components of the window/door (IGU, hardware fittings, gaskets/seals, and sealants), transportation of these components, and window assembly (aka fabrication). Packaging of windows is also included.

These modules also include the generation and transmission of electricity in New Zealand, generation of thermal energy from natural gas, generation of liquid petroleum gas, supply of water, and solid waste and wastewater management.

Table 5: Modules of the production life cycle included in the EPD

(X = declared module; ND = module not declared)

	Product stage			Construction process stage		Use stage							End-of-life stage				Recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	NZ										NZ	NZ	NZ	NZ	NZ
Specific data	>90%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	N/A																
Variation - sites	N/A																

***0.48% of APL windows and doors are shipped to and fabricated in the South Pacific - Fiji, Rarotonga, Samoa, and Tahiti. Hence, a weighted average distance between APL manufacturing site and fabricators is considered.*

End-of-life stage (Modules C1-C4)

Module C1 (deconstruction/demolition) includes demolition of the whole building including a window/door using mass allocation, based on a 100-kW construction excavator.

Module C2 (transport to end-of-life) includes transport of waste window/door to waste management facilities, following building demolition.

Module C3 (waste processing) includes the processing of window/door waste for reuse or recycling.

Module C4 (disposal) includes window/door end-of-life which is a combination of landfill and recycling.

Benefits and loads beyond the system boundary (Module D)

Module D (reuse-recovery-recycling-potential) includes recovered aluminium and stainless steel scraps that are fed into a second life cycle. This module is modeled considering the avoided virgin aluminium and stainless steel production in New Zealand. Also, the energy recovered from landfill is accounted for.

Life Cycle Inventory (LCI) Data And Assumptions

Primary data was used for all manufacturing operations up to the factory gate, including upstream data for aluminium extrusion and finishing (powder coating and anodising). Primary data for aluminium extrusion, finishing, hardware component manufacturing (including seals), and fabrication was sourced for the period 01 July 2020 to 30 June 2021.

Background data was used for input materials sourced from other suppliers such as glass, components, and packaging materials.

All data in the background system were from the GaBi Professional Life Cycle Inventory Database 2022 (Sphera, 2022). Most datasets have a reference year between 2017 and 2021 and all fall within the 10-year limit allowable for generic data under EN 15804 and the PCR.

Upstream data

With the exception of energy and water use (which correctly reflect New Zealand conditions), minor upstream (supply chain) data used was European/Canadian due to a lack of consistent LCI data for New Zealand at the time this study was conducted – for example, aluminium ingot produced at the Tiwai Smelter in Southland was largely modelled using the background datasets in the GaBi Life Cycle Inventory Database 2022 (Sphera, 2022).

Electricity

Electricity consumption was modelled using the specific electricity mix in New Zealand. The country-specific electricity data was based on background data from the GaBi Life Cycle Inventory Database 2022 (Sphera, 2022).

The consumption mix in New Zealand resulting in GWP of 0.126 kg CO₂ eq. per kWh.

During the period 01 July 2020 to 30 June 2021, APL had redeemed 20,663 New Zealand Energy Certificate System (NZECS) certificates – equivalent of 26% of APL's operations in the same period. The use of NZECS certificates is accounted for – including the upstream impacts related hydro power generation.

Recycling

Benefits from recycling the recovered aluminium and stainless steel in Module C4 are considered in Module D. Both metals' credits are modelled as avoided burdens of virgin materials. Both metals are modelled towards fully virgin production, considering recycling efficiency. This leads to recycling credits being slightly lower than the impact of virgin production.

Transport

Where transport data was not available, a standard value of 50 km is used.



Cut off criteria

Cut-off criteria are applied for aluminium scraps in Module A3 – impacts associated with transportation to the recycling facility are considered but the recycling impacts are excluded.

The impacts associated with the production of steel frames (for IGU packaging) are excluded in this work, given their very high reuse rates - but their weights are considered when calculating transport-related impacts.

Hardware fittings and seals/gaskets manufactured in New Zealand are generally packed in plastic coils for distribution. Manufacturing of reusable plastic coils are excluded from this study due to very high reuse rates. These plastic coils are also produced in New Zealand. As there is a financial incentive to return the plastic coils, a return rate of 100% is assumed. Thus, the impacts associated with the manufacturing of these coils are not considered.

Product packaging end-of-life is not considered in the study (polluter pays) as the packaging is removed in Module A5.

Cut-off criteria are applied for recovered aluminium and stainless steel scraps in Module C4 – impacts associated with transportation and recycling of these metals are not considered in this study, but the credits are given for avoided virgin metals (in Module D).

Personnel is excluded as per section 4.3.1 in the PCR (EPD International, 2021). Thinkstep-anz consistently excludes environmental impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process, ('capital goods') regardless of potential significance. High-quality infrastructure related data isn't always available and there is no clear cut-off for what to include. For this reason, capital goods data are applied to LCA studies inconsistently. This is expected to lead to reduced consistency and comparability of EPDs. Capital goods are previously excluded from EPDs, thus including capital goods in current EPDs would further reduce their comparability.



Allocation

Multi-output allocation generally follows the requirements of ISO 14044, section 4.3.4.2.

Allocation is necessary for APL, since input/outputs (including aluminium extrusions and IGUs) are measured only at the site level. Impacts associated with these inputs/outputs have been allocated on a mass basis, with the assumption that all products require the same share.

Where subdivision of processes was not possible, allocation rules listed in PCR chapter 6.7 have been applied.

No secondary materials were used in the production processes. Allocation for input materials that contain secondary material occurs in the upstream datasets.

End-of-life allocation generally follows the requirements of ISO 14044, section 4.3.4.3.

Landfilling (avoided burden approach): In cases where materials are sent to landfills, they are linked to an inventory that accounts for waste composition, regional leakage rates, landfill gas capture as well as utilisation rates (flaring vs. power production). A credit is assigned for power output using the regional grid mix.

Material recycling (cut-off approach): Any open scrap inputs into manufacturing remain unconnected. The system boundary at end of life is drawn after scrap collection to account for the collection rate, which generates an open scrap output for the product system. The processing and recycling of the scrap is associated with the subsequent product system and is not considered in this study.

Assessment Indicators

The results tables describe the different environmental indicators for each product per declared unit, for each declared module. The first section of each table contains the environmental impact indicators, describing the potential environmental impacts of the product as shown in Table 6. The second section shows the resource indicators, describing the use of renewable and non-renewable material resources, renewable and non-renewable primary energy and water, as shown in Table 7.

The final section of each table displays the waste and other outputs, as shown in Table 8.

Environmental impacts

The reported impact categories represent impact potentials, i.e., they are approximations of environmental impacts that could occur if the emissions would (a) follow the underlying impact pathway and (b) meet certain conditions in the receiving environment while doing so. The environmental impact results are therefore relative expressions only and do not predict actual impacts, the exceeding of thresholds, safety margins, or risks.

Long-term emissions (>100 years) are not taken into consideration in the impact estimate.

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

Table 6: Indicators for life cycle impact assessment (CEN, 2019)

Impact category	Abbreviation
Climate change – total	GWP
Climate change – fossil	GWPf
Climate change – biogenic	GWPb
Climate change – land use and land use change	GWPluluc
Ozone depletion	ODP
Acidification	AP
Eutrophication aquatic freshwater	EPfw
Eutrophication aquatic marine	EPm
Eutrophication terrestrial	EPT
Photochemical ozone formation potential	POCP
Depletion of abiotic resources – minerals and metals*	ADPmm
Depletion of abiotic resources – fossil fuels*	ADPf
Water Depletion Potential*	WDP

Additional environmental impact indicators

Optional environmental impact categories provide further information on environmental impacts.

Table 7: Additional Environmental Impact Indicators * as shown below

Indicator	Abbreviation
Climate Change, IPCC AR5 GWP**	GWP-GHG ¹
Particulate Matter emissions	PM
Ionizing radiation - human health***	IRP
Eco-toxicity – freshwater*	ETP-fw
Human toxicity, cancer*	HTP-c
Human toxicity, non-cancer*	HTP-nc
Land use related impacts / soil quality*	SQP

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

**This indicator is calculated using the characterisation factors from the IPCC AR5 report (IPCC 2013) and has been included in the EPD following the PCR.

***This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and some construction materials, is not measured by this indicator.

¹ The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product.

Resource Use indicators

The resource use indicators describe the use of renewable and non-renewable material resources, renewable and non-renewable primary energy and water. Note: Water consumption: The FW indicator in the EPD results tables reports consumption (i.e. net use) of 'blue water' (which includes river water, lake water and ground water). This indicator deliberately excludes consumption of 'green water' (rainwater), as net loss should be interpreted as any additional water loss beyond what would occur in the original, natural system. For plantation softwood forestry, the natural system might be a native forest or a grassland.

Table 8: Life cycle inventory indicators on use of resources

Indicator	Abbreviation
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE
Use of renewable primary energy resources used as raw materials	PERM
Total use of renewable primary energy resources	PERT
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE
Use of non-renewable primary energy resources used as raw materials	PENRM
Total use of non-renewable primary energy resources	PENRT
Use of secondary material	SM
Use of renewable secondary fuels	RSF
Use of non-renewable secondary fuels	NRSF
Total use of net fresh water	FW

Waste and Output Flows

Waste indicators describe waste generated within the life cycle of the product. Waste is categorised by hazard class, end-of-life fate and exported energy content.

Table 9: Life cycle inventory indicators on waste categories and output flows

Indicator	Abbreviation
Hazardous waste disposed	HWD
Non-hazardous waste disposed	NHWD
Radioactive waste disposed	RWD
Components for reuse	CRU
Materials for energy recovery	MER
Materials for recycling	MFR
Exported electrical energy	EEE
Exported thermal energy	EET

Biogenic Carbon Content

Table 10. Biogenic carbon content

Indicator	Abbreviation
Biogenic carbon content - product	BCC-prod
Biogenic carbon content - packaging	BCC-pack

Environmental impact indicators EN15804+A1

EN 15804+A1 Core environmental impact categories aid comparison and backwards compatibility with rating tools.

Table 11: Environmental Impact Indicators in accordance with EN15804+A1

Indicator	Abbreviation
Global warming potential	GWP
Ozone depletion potential	ODP
Acidification potential	AP
Eutrophication potential	EP
Photochemical ozone creation potential	POCP
Abiotic depletion potential for non-fossil resources	ADPE
Abiotic depletion potential for fossil resources	ADPF

For all products, the following indicators are not relevant, hence result in zero values:

- Components for re-use (CRU) is zero since there are none produced
- Use of secondary material (SM) is zero since there are none used
- Use of renewable secondary fuels (RSF) is zero since there are none used
- Use of non-renewable secondary fuels (NRSF) is zero since there are none used
- Materials for energy recovery (MER) is zero since no credits are claimed for any incinerated wastes, applying the cut-off approach
- Exported electrical energy (EEE) is zero since there is none produced
- Exported thermal energy (EET) is zero since there is none produced.



Environmental Performance

A1-A3 Modules

Table 12: Module A1-A3 LCA results based on EN15804+A2 core environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
GWP	kg CO ₂ -eq.	61.5	124	113	110	82.6	96.9	98.4	
GWPf	kg CO ₂ -eq.	62.4	125	114	110	83.3	97.5	99.1	
GWPb	kg CO ₂ -eq.	-0.92	-0.395	-0.786	-0.313	-0.684	-0.661	-0.674	
GWPluluc	kg CO ₂ -eq.	0.0148	0.0218	0.0208	0.0199	0.0171	0.018	0.0178	
ODP	kg CFC11-eq.	1.09E-10	2.84E-10	2.56E-10	2.44E-10	1.75E-10	2.20E-10	2.26E-10	
AP	Mole of H+ eq.	0.443	0.801	0.728	0.717	0.552	0.625	0.633	
EPfw	kg P eq.	7.09E-05	1.27E-04	1.16E-04	1.14E-04	8.91E-05	1.01E-04	1.01E-04	
EPm	kg N eq.	0.0806	0.105	0.0977	0.0987	0.0833	0.0845	0.0836	
EPt	Mole of N eq.	0.910	1.18	1.09	1.10	0.931	0.941	0.932	
POCP	kg NMVOC eq.	0.204	0.307	0.284	0.282	0.230	0.246	0.245	
ADPmm	kg Sb-eq.	6.28E-05	9.23E-05	5.06E-04	8.36E-05	4.56E-04	4.86E-04	3.57E-04	
ADPf	MJ	679	1,200	1,100	1,080	836	946	954	
WDP	m ³ world equiv.	12.9	32.7	30.2	28.2	21.0	25.9	26.3	

Table 13: Module A1-A3 LCA results based on EN15804+A2 Additional environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
PM	Disease incidences	6.34E-06	1.41E-05	1.29E-05	1.24E-05	9.17E-06	1.11E-05	1.13E-05	
IRP	kBq U235 eq.	1.09	2.09	2.27	1.86	1.56	1.91	1.91	
ETP-fw	CTUe	841	1,140	1,020	1,060	860	880	879	
HTP-c	CTUh	3.98E-08	8.54E-08	1.63E-07	7.50E-08	1.74E-07	1.86E-07	1.26E-07	
HTP-nc	CTUh	2.16E-06	2.54E-06	2.49E-06	2.42E-06	2.23E-06	2.18E-06	2.10E-06	
SQP	Pt	612	966	964	843	722	824	840	
IPCC AR5 GWP100	kg CO ₂ -eq.	62.5	125	114	111	83.7	98.0	99.5	

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	63.8	131	139	121	96.7	116	122	75.3	88.3
	64.7	130	140	121	97.4	116	123	75.0	89.0
	-0.92	-0.391	-0.731	-0.292	-0.657	-0.624	-0.621	0.283	-0.718
	0.0149	0.0219	0.0253	0.0211	0.0184	0.02	0.0216	0.0153	0.0167
	1.17E-10	3.05E-10	3.28E-10	2.78E-10	2.14E-10	2.71E-10	2.89E-10	1.51E-10	1.94E-10
	0.455	0.832	0.875	0.780	0.632	0.733	0.768	0.508	0.584
	7.29E-05	1.32E-04	1.41E-04	1.24E-04	1.02E-04	1.17E-04	1.23E-04	8.09E-05	9.30E-05
	0.0809	0.104	0.111	0.102	0.0891	0.0923	0.0954	0.0799	0.0833
	0.912	1.16	1.23	1.14	0.994	1.03	1.06	0.899	0.932
	0.207	0.311	0.332	0.297	0.254	0.277	0.289	0.215	0.233
	6.28E-05	7.76E-05	5.97E-04	7.61E-05	3.82E-04	4.13E-04	4.28E-04	6.17E-05	6.80E-05
	696	1,250	1,360	1,170	965	1,100	1,180	769	883
	13.8	34.9	37.4	31.9	25.1	31.5	33.1	17.6	22.3

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	6.65E-06	1.50E-05	1.58E-05	1.38E-05	1.09E-05	1.33E-05	1.40E-05	7.97E-06	9.90E-06
	1.13	2.18	3.13	2.04	1.91	2.17	2.56	1.28	1.57
	845	1,130	1,170	1,100	934	977	1,020	848	888
	4.16E-08	8.99E-08	7.64E-07	8.32E-08	1.15E-07	1.30E-07	5.18E-07	4.97E-08	8.21E-08
	2.15E-06	2.45E-06	2.71E-06	2.43E-06	2.30E-06	2.28E-06	2.31E-06	2.07E-06	2.06E-06
	630	1,010	1,110	925	819	957	984	461	772
	64.9	131	140	122	97.9	117	123	75.2	89.4

**Table 14: Module A1-A3 LCA results based on EN15804+A2
Resource use indicators for 1 m² of APL windows and doors**

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
PERE	MJ	441	1,200	1,080	1,030	731	925	953	
PERM	MJ	12.0	8.0	12.0	6.84	10.3	10.3	10.3	
PERT	MJ	453	1,210	1,100	1,030	741	935	963	
PENRE	MJ	679	1,200	1,100	1,080	836	946	954	
PENRM	MJ	0	0	0.011	0	1.02	1.02	0.015	
PENRT	MJ	679	1,200	1,100	1,080	837	947	954	
SM	kg	0	0	0	0	0	0	0	
RSF	MJ	0	0	0	0	0	0	0	
NRSF	MJ	0	0	0	0	0	0	0	
FW	m ³	1.29	3.62	3.26	3.10	2.19	2.78	2.88	

Table 15: Module A1-A3 LCA results based on EN15804+A2 Waste material and output flow indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
HWD	kg	1.54E-04	4.95E-04	4.43E-04	4.20E-04	2.88E-04	3.77E-04	3.92E-04	
NHWD	kg	3.58	4.61	4.61	4.34	3.8	3.96	3.89	
RWD	kg	0.0067	0.012	0.0134	0.0107	0.00975	0.0115	0.0112	
CRU	kg	0	0	0	0	0	0	0	
MFR	kg	2.09	4.88	4.37	4.25	3.07	3.75	3.84	
MER	kg	0	0	0	0	0	0	0	
EEE	MJ	0	0	0	0	0	0	0	
EET	MJ	0	0	0	0	0	0	0	

Table 16: Module A1-A3 LCA results based on EN15804+A2 biogenic carbon content for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
BCC-prod	kg	0.588	0.392	0.588	0.493	0.740	0.740	0.740	
BCC-pack	kg	0.543	1.74	1.56	2.17	1.49	1.95	2.03	

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	472	1,290	1,330	1,170	896	1,150	1,190	628	806
	12.0	8.0	12.0	6.84	10.3	10.3	10.3	0	10.3
	484	1,300	1,350	1,170	906	1,160	1,200	628	816
	697	1,250	1,350	1,170	960	1,100	1,170	769	883
	0	0	12.5	0	5.72	1.02	8.51	0	0.00748
	697	1,250	1,360	1,170	965	1,100	1,180	769	883
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	1.39	3.91	4.03	3.54	2.70	3.48	3.61	1.88	2.42

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	1.69E-04	5.39E-04	5.49E-04	4.86E-04	3.61E-04	4.78E-04	4.94E-04	2.43E-04	3.25E-04
	3.6	4.55	5.76	4.45	4.12	4.24	4.75	3.54	3.74
	0.00687	0.0123	0.0179	0.0116	0.0114	0.0127	0.0147	0.00762	0.00903
	0	0	0	0	0	0	0	0	0
	2.21	5.20	5.30	4.77	3.69	4.59	4.74	2.72	3.38
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	0.588	0.493	0.588	0.493	0.740	0.740	0.740	0	0.740
	0.595	2.52	1.93	2.52	1.87	2.48	2.56	0.855	1.68

C1 Module

Table 17: Module C1 LCA results based on EN15804+A2 core environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
GWP	kg CO ₂ -eq.	15.3	19.7	17.9	18.5	15.3	15.4	15.4	
GWPf	kg CO ₂ -eq.	15.3	19.7	17.9	18.5	15.3	15.4	15.4	
GWPb	kg CO ₂ -eq.	-0.00528	-0.00681	-0.00617	-0.00638	-0.00527	-0.00532	-0.00532	
GWPluluc	kg CO ₂ -eq.	1.65E-04	2.12E-04	1.92E-04	1.99E-04	1.64E-04	1.66E-04	1.66E-04	
ODP	kg CFC11-eq.	1.53E-12	1.98E-12	1.80E-12	1.85E-12	1.53E-12	1.55E-12	1.55E-12	
AP	Mole of H+ eq.	0.0768	0.0990	0.0899	0.0928	0.0767	0.0774	0.0774	
EPfw	kg P eq.	2.52E-06	3.24E-06	2.94E-06	3.04E-06	2.51E-06	2.53E-06	2.53E-06	
EPm	kg N eq.	0.0365	0.0470	0.0427	0.0441	0.0364	0.0368	0.0368	
EPt	Mole of N eq.	0.400	0.515	0.468	0.483	0.399	0.403	0.403	
POCP	kg NMVOC eq.	0.102	0.132	0.119	0.123	0.102	0.103	0.103	
ADPmm	kg Sb-eq.	2.75E-07	3.55E-07	3.22E-07	3.33E-07	2.75E-07	2.77E-07	2.77E-07	
ADPf	MJ	203	261	237	245	203	204	204	
WDP	m ³ world equiv.	0.0967	0.125	0.113	0.117	0.0966	0.0974	0.0974	

Table 18: Module C1 LCA results based on EN15804+A2 Additional environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
PM	Disease incidences	8.81E-07	1.14E-06	1.03E-06	1.06E-06	8.80E-07	8.88E-07	8.88E-07	
IRP	kBq U235 eq.	0.00515	0.00664	0.00602	0.00622	0.00514	0.00519	0.00519	
ETP-fw	CTUe	81.4	105	95.2	98.3	81.3	82.0	81.9	
HTP-c	CTUh	1.37E-09	1.77E-09	1.61E-09	1.66E-09	1.37E-09	1.38E-09	1.38E-09	
HTP-nc	CTUh	6.88E-08	8.87E-08	8.04E-08	8.31E-08	6.87E-08	6.93E-08	6.93E-08	
SQP	Pt	0.572	0.737	0.669	0.691	0.571	0.576	0.576	
IPCC AR5 GWP100	kg CO ₂ -eq.	15.2	19.6	17.8	18.4	15.2	15.3	15.3	

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	15.3	19.5	20.1	19.0	16.4	16.9	17.4	14.8	15.7
	15.3	19.5	20.1	19.0	16.4	16.9	17.5	14.8	15.7
	-0.0053	-0.00674	-0.00694	-0.00656	-0.00567	-0.00584	-0.00603	-0.00511	-0.00541
	1.65E-04	2.10E-04	2.16E-04	2.05E-04	1.77E-04	1.82E-04	1.88E-04	1.59E-04	1.69E-04
	1.54E-12	1.96E-12	2.02E-12	1.91E-12	1.65E-12	1.70E-12	1.75E-12	1.49E-12	1.57E-12
	0.0771	0.0981	0.101	0.0955	0.0826	0.0851	0.0877	0.0744	0.0788
	2.52E-06	3.21E-06	3.31E-06	3.13E-06	2.70E-06	2.78E-06	2.87E-06	2.44E-06	2.58E-06
	0.0366	0.0466	0.0480	0.0454	0.0392	0.0404	0.0417	0.0353	0.0374
	0.401	0.511	0.525	0.497	0.430	0.443	0.456	0.387	0.410
	0.102	0.130	0.134	0.127	0.110	0.113	0.117	0.0989	0.105
	2.76E-07	3.52E-07	3.62E-07	3.42E-07	2.96E-07	3.05E-07	3.14E-07	2.67E-07	2.82E-07
	203	259	266	252	218	225	232	196	208
	0.097	0.124	0.127	0.120	0.104	0.107	0.110	0.0937	0.0992

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	8.84E-07	1.13E-06	1.16E-06	1.10E-06	9.47E-07	9.76E-07	1.01E-06	8.54E-07	9.04E-07
	0.00517	0.00658	0.00677	0.0064	0.00554	0.0057	0.00588	0.00499	0.00528
	81.6	104	107	101	87.5	90.1	92.9	78.8	83.4
	1.38E-09	1.75E-09	1.80E-09	1.71E-09	1.47E-09	1.52E-09	1.57E-09	1.33E-09	1.41E-09
	6.90E-08	8.78E-08	9.04E-08	8.55E-08	7.39E-08	7.61E-08	7.85E-08	6.66E-08	7.05E-08
	0.574	0.731	0.752	0.711	0.615	0.633	0.653	0.554	0.587
	15.3	19.5	20.0	18.9	16.4	16.9	17.4	14.8	15.6

**Table 19: Module C1 LCA results based on EN15804+A2
Resource use indicators for 1 m² of APL windows and doors**

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
PERE	MJ	0.991	1.28	1.16	1.20	0.990	0.998	0.998	
PERM	MJ	0	0	0	0	0	0	0	
PERT	MJ	0.991	1.28	1.16	1.20	0.990	0.998	0.998	
PENRE	MJ	203	261	237	245	203	204	204	
PENRM	MJ	0	0	0	0	0	0	0	
PENRT	MJ	203	261	237	245	203	204	204	
SM	kg	0	0	0	0	0	0	0	
RSF	MJ	0	0	0	0	0	0	0	
NRSF	MJ	0	0	0	0	0	0	0	
FW	m ³	0.00193	0.00249	0.00226	0.00233	0.00193	0.00195	0.00195	

**Table 20: Module C1 LCA results based on EN15804+A2 Waste material and output flow indicators
for 1 m² of APL windows and doors**

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
HWD	kg	3.29E-10	4.24E-10	3.85E-10	3.97E-10	3.29E-10	3.32E-10	3.31E-10	
NHWD	kg	0.00492	0.00634	0.00575	0.00594	0.00491	0.00496	0.00495	
RWD	kg	3.96E-05	5.11E-05	4.63E-05	4.78E-05	3.96E-05	3.99E-05	3.99E-05	
CRU	kg	0	0	0	0	0	0	0	
MFR	kg	0	0	0	0	0	0	0	
MER	kg	0	0	0	0	0	0	0	
EEE	MJ	0	0	0	0	0	0	0	
EET	MJ	0	0	0	0	0	0	0	

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	0.994	1.27	1.30	1.23	1.07	1.10	1.13	0.960	1.02
	0	0	0	0	0	0	0	0	0
	0.994	1.27	1.30	1.23	1.07	1.10	1.13	0.960	1.02
	203	259	266	252	218	225	232	196	208
	0	0	0	0	0	0	0	0	0
	203	259	266	252	218	225	232	196	208
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0.00194	0.00247	0.00254	0.00240	0.00208	0.00214	0.00221	0.00187	0.00198

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	3.30E-10	4.20E-10	4.32E-10	4.09E-10	3.54E-10	3.64E-10	3.76E-10	3.19E-10	3.38E-10
	0.00494	0.00628	0.00646	0.00612	0.00529	0.00545	0.00562	0.00476	0.00505
	3.97E-05	5.06E-05	5.20E-05	4.92E-05	4.26E-05	4.39E-05	4.52E-05	3.84E-05	4.06E-05
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0

C2 Module

Table 21: Module C2 LCA results based on EN15804+A2 core environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
GWP	kg CO ₂ -eq.	0.104	0.134	0.122	0.126	0.104	0.105	0.105	
GWPf	kg CO ₂ -eq.	0.0999	0.129	0.117	0.121	0.0998	0.101	0.101	
GWPb	kg CO ₂ -eq.	0.00439	0.00566	0.00513	0.0053	0.00438	0.00442	0.00442	
GWP _{luluc}	kg CO ₂ -eq.	1.12E-06	1.45E-06	1.31E-06	1.36E-06	1.12E-06	1.13E-06	1.13E-06	
ODP	kg CFC11-eq.	1.05E-14	1.35E-14	1.22E-14	1.26E-14	1.05E-14	1.05E-14	1.05E-14	
AP	Mole of H+ eq.	1.87E-04	2.41E-04	2.18E-04	2.26E-04	1.86E-04	1.88E-04	1.88E-04	
EP _{fw}	kg P eq.	1.72E-08	2.21E-08	2.01E-08	2.07E-08	1.71E-08	1.73E-08	1.73E-08	
EP _m	kg N eq.	7.83E-05	1.01E-04	9.16E-05	9.46E-05	7.82E-05	7.89E-05	7.89E-05	
EP _t	Mole of N eq.	8.64E-04	0.00111	0.00101	0.00104	8.62E-04	8.70E-04	8.70E-04	
POCP	kg NMVOC eq.	1.83E-04	2.36E-04	2.14E-04	2.21E-04	1.83E-04	1.85E-04	1.85E-04	
ADP _m	kg Sb-eq.	1.88E-09	2.42E-09	2.20E-09	2.27E-09	1.88E-09	1.89E-09	1.89E-09	
ADP _f	MJ	1.38	1.78	1.62	1.67	1.38	1.39	1.39	
WDP	m ³ world equiv.	6.60E-04	8.51E-04	7.72E-04	7.97E-04	6.59E-04	6.65E-04	6.65E-04	

Table 22: Module C2 LCA results based on EN15804+A2 Additional environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
PM	Disease incidences	1.32E-09	1.70E-09	1.55E-09	1.60E-09	1.32E-09	1.33E-09	1.33E-09	
IRP	kBq U235 eq.	3.51E-05	4.53E-05	4.11E-05	4.24E-05	3.51E-05	3.54E-05	3.54E-05	
ETP- _{fw}	CTUe	0.555	0.715	0.649	0.670	0.554	0.559	0.559	
HTP-c	CTUh	9.37E-12	1.21E-11	1.10E-11	1.13E-11	9.35E-12	9.44E-12	9.43E-12	
HTP-nc	CTUh	3.32E-10	4.28E-10	3.88E-10	4.01E-10	3.32E-10	3.35E-10	3.34E-10	
SQP	Pt	0.0039	0.00503	0.00456	0.00471	0.0039	0.00393	0.00393	
IPCC AR5 GWP100	kg CO ₂ -eq.	0.100	0.129	0.117	0.120	0.100	0.100	0.100	

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	0.105	0.133	0.137	0.130	0.112	0.115	0.119	0.101	0.107
	0.100	0.128	0.131	0.124	0.107	0.111	0.114	0.0968	0.102
	0.0044	0.0056	0.00577	0.00546	0.00472	0.00486	0.00501	0.00425	0.0045
	1.13E-06	1.43E-06	1.47E-06	1.40E-06	1.21E-06	1.24E-06	1.28E-06	1.09E-06	1.15E-06
	1.05E-14	1.34E-14	1.38E-14	1.30E-14	1.13E-14	1.16E-14	1.20E-14	1.01E-14	1.07E-14
	1.87E-04	2.38E-04	2.45E-04	2.32E-04	2.01E-04	2.07E-04	2.13E-04	1.81E-04	1.91E-04
	1.72E-08	2.19E-08	2.25E-08	2.13E-08	1.84E-08	1.90E-08	1.96E-08	1.66E-08	1.76E-08
	7.86E-05	1.00E-04	1.03E-04	9.74E-05	8.42E-05	8.67E-05	8.94E-05	7.59E-05	8.03E-05
	8.66E-04	0.00110	0.00113	0.00107	9.28E-04	9.56E-04	9.86E-04	8.36E-04	8.86E-04
	1.84E-04	2.34E-04	2.41E-04	2.28E-04	1.97E-04	2.03E-04	2.09E-04	1.78E-04	1.88E-04
	1.88E-09	2.40E-09	2.47E-09	2.34E-09	2.02E-09	2.08E-09	2.14E-09	1.82E-09	1.93E-09
	1.39	1.77	1.82	1.72	1.49	1.53	1.58	1.34	1.42
	6.62E-04	8.43E-04	8.67E-04	8.20E-04	7.09E-04	7.31E-04	7.53E-04	6.39E-04	6.77E-04

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	1.33E-09	1.69E-09	1.74E-09	1.64E-09	1.42E-09	1.46E-09	1.51E-09	1.28E-09	1.36E-09
	3.52E-05	4.49E-05	4.62E-05	4.37E-05	3.78E-05	3.89E-05	4.01E-05	3.40E-05	3.60E-05
	0.557	0.709	0.729	0.690	0.596	0.614	0.633	0.537	0.569
	9.40E-12	1.20E-11	1.23E-11	1.16E-11	1.01E-11	1.04E-11	1.07E-11	9.07E-12	9.61E-12
	3.33E-10	4.24E-10	4.36E-10	4.13E-10	3.57E-10	3.68E-10	3.79E-10	3.22E-10	3.41E-10
	0.00391	0.00498	0.00513	0.00485	0.00419	0.00432	0.00445	0.00378	0.00400
	0.100	0.127	0.131	0.124	0.107	0.110	0.114	0.097	0.102

Table 23: Module C2 LCA results based on EN15804+A2
Resource use indicators for 1 m² of APL windows and doors

Abb.	Product		RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units									
PERE	MJ		0.00676	0.00871	0.00791	0.00816	0.00675	0.00681	0.00681	
PERM	MJ		0	0	0	0	0	0	0	
PERT	MJ		0.00676	0.00871	0.00791	0.00816	0.00675	0.00681	0.00681	
PENRE	MJ		1.38	1.78	1.62	1.67	1.38	1.39	1.39	
PENRM	MJ		0	0	0	0	0	0	0	
PENRT	MJ		1.38	1.78	1.62	1.67	1.38	1.39	1.39	
SM	kg		0	0	0	0	0	0	0	
RSF	MJ		0	0	0	0	0	0	0	
NRSF	MJ		0	0	0	0	0	0	0	
FW	m ³		1.32E-05	1.70E-05	1.54E-05	1.59E-05	1.32E-05	1.33E-05	1.33E-05	

Table 24: Module C2 LCA results based on EN15804+A2
Waste material and output flow indicators for 1 m² of APL windows and doors

Abb.	Product		RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units									
HWD	kg		2.24E-12	2.89E-12	2.63E-12	2.71E-12	2.24E-12	2.26E-12	2.26E-12	
NHWD	kg		3.36E-05	4.33E-05	3.93E-05	4.05E-05	3.35E-05	3.38E-05	3.38E-05	
RWD	kg		2.70E-07	3.48E-07	3.16E-07	3.26E-07	2.70E-07	2.72E-07	2.72E-07	
CRU	kg		0	0	0	0	0	0	0	
MFR	kg		0	0	0	0	0	0	0	
MER	kg		0	0	0	0	0	0	0	
EEE	MJ		0	0	0	0	0	0	0	
EET	MJ		0	0	0	0	0	0	0	

C3 Module

As all window/door waste goes straight to landfill at end-of-life, there is no waste processing involved. Therefore, waste processing impacts have been modelled as zero for this EPD.

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	0.00678	0.00863	0.00888	0.0084	0.00727	0.00748	0.00772	0.00655	0.00693
	0	0	0	0	0	0	0	0	0
	0.00678	0.00863	0.00888	0.0084	0.00727	0.00748	0.00772	0.00655	0.00693
	1.39	1.77	1.82	1.72	1.49	1.53	1.58	1.34	1.42
	0	0	0	0	0	0	0	0	0
	1.39	1.77	1.82	1.72	1.49	1.53	1.58	1.34	1.42
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	1.32E-05	1.68E-05	1.73E-05	1.64E-05	1.42E-05	1.46E-05	1.50E-05	1.28E-05	1.35E-05

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	2.25E-12	2.87E-12	2.95E-12	2.79E-12	2.41E-12	2.49E-12	2.56E-12	2.17E-12	2.30E-12
	3.37E-05	4.29E-05	4.41E-05	4.17E-05	3.61E-05	3.72E-05	3.83E-05	3.25E-05	3.44E-05
	2.71E-07	3.45E-07	3.55E-07	3.36E-07	2.90E-07	2.99E-07	3.08E-07	2.62E-07	2.77E-07
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0

C4 Module

Table 25: Module C4 LCA results based on EN15804+A2 core environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
GWP	kg CO ₂ -eq.	2.04	1.45	2.00	1.28	1.74	1.71	1.71	
GWPf	kg CO ₂ -eq.	0.336	0.322	0.297	0.314	0.282	0.256	0.254	
GWPb	kg CO ₂ -eq.	1.70	1.13	1.70	0.965	1.45	1.45	1.45	
GWP _{luluc}	kg CO ₂ -eq.	5.66E-04	5.59E-04	4.94E-04	5.49E-04	4.74E-04	4.26E-04	4.22E-04	
ODP	kg CFC11-eq.	7.53E-13	7.33E-13	6.62E-13	7.17E-13	6.32E-13	5.71E-13	5.66E-13	
AP	Mole of H+ eq.	0.00228	0.00221	0.002	0.00217	0.00191	0.00173	0.00171	
EP _{fw}	kg P eq.	5.30E-07	5.20E-07	4.64E-07	5.10E-07	4.45E-07	4.01E-07	3.97E-07	
EP _m	kg N eq.	5.96E-04	5.76E-04	5.26E-04	5.62E-04	5.01E-04	4.54E-04	4.49E-04	
EP _t	Mole of N eq.	0.00655	0.00632	0.00577	0.00618	0.0055	0.00498	0.00494	
POCP	kg NMVOC eq.	0.00193	0.00183	0.00171	0.00177	0.00162	0.00148	0.00146	
ADP _m	kg Sb-eq.	3.41E-08	3.28E-08	3.01E-08	3.20E-08	2.86E-08	2.59E-08	2.57E-08	
ADP _f	MJ	4.41	4.23	3.90	4.12	3.70	3.36	3.33	
WDP	m ³ world equiv.	0.0337	0.0332	0.0294	0.0326	0.0282	0.0254	0.0252	

Table 26: Module C4 LCA results based on EN15804+A2 Additional environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
PM	Disease incidences	2.73E-08	2.67E-08	2.39E-08	2.62E-08	2.29E-08	2.06E-08	2.04E-08	
IRP	kBq U235 eq.	0.00509	0.00499	0.00446	0.00489	0.00427	0.00385	0.00382	
ETP- _{fw}	CTUe	6.15	14.2	13.5	12.4	9.54	11.6	11.7	
HTP-c	CTUh	3.52E-10	3.45E-10	3.08E-10	3.38E-10	2.95E-10	2.66E-10	2.64E-10	
HTP-nc	CTUh	3.87E-08	3.80E-08	3.39E-08	3.73E-08	3.25E-08	2.92E-08	2.90E-08	
SQP	Pt	0.842	0.829	0.735	0.814	0.706	0.635	0.629	
IPCC AR5 GWP100	kg CO ₂ -eq.	0.760	0.605	0.721	0.556	0.645	0.619	0.617	

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	2.03	1.44	2.01	1.27	1.74	1.72	1.72	0.260	1.74
	0.333	0.305	0.311	0.306	0.287	0.262	0.267	0.267	0.287
	1.70	1.13	1.70	0.965	1.45	1.45	1.45	-0.00792	1.45
	5.59E-04	5.26E-04	5.19E-04	5.34E-04	4.84E-04	4.37E-04	4.46E-04	4.93E-04	4.84E-04
	7.45E-13	6.91E-13	6.93E-13	6.99E-13	6.44E-13	5.84E-13	5.95E-13	6.28E-13	6.44E-13
	0.00225	0.00209	0.0021	0.00211	0.00195	0.00177	0.0018	0.00189	0.00195
	5.24E-07	4.90E-07	4.87E-07	4.96E-07	4.53E-07	4.10E-07	4.18E-07	4.53E-07	4.53E-07
	5.90E-04	5.43E-04	5.50E-04	5.48E-04	5.10E-04	4.63E-04	4.72E-04	4.84E-04	5.10E-04
	0.00648	0.00597	0.00604	0.00602	0.0056	0.00509	0.00519	0.00532	0.0056
	0.00191	0.00173	0.00179	0.00173	0.00165	0.00151	0.00153	0.00147	0.00165
	3.37E-08	3.10E-08	3.14E-08	3.12E-08	2.91E-08	2.65E-08	2.70E-08	2.74E-08	2.91E-08
	4.36	3.99	4.07	4.01	3.77	3.43	3.50	3.50	3.77
	0.0333	0.0313	0.0309	0.0318	0.0288	0.026	0.0265	0.0293	0.0288

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	2.70E-08	2.52E-08	2.50E-08	2.55E-08	2.33E-08	2.11E-08	2.15E-08	2.33E-08	2.33E-08
	0.00503	0.0047	0.00468	0.00476	0.00436	0.00394	0.00402	0.00432	0.00435
	6.49	15.2	16.5	13.9	11.3	13.9	14.5	7.8	9.93
	3.48E-10	3.25E-10	3.23E-10	3.29E-10	3.01E-10	2.72E-10	2.78E-10	2.99E-10	3.01E-10
	3.83E-08	3.58E-08	3.55E-08	3.63E-08	3.31E-08	2.99E-08	3.05E-08	3.31E-08	3.31E-08
	0.832	0.780	0.772	0.792	0.720	0.650	0.663	0.728	0.720
	0.757	0.587	0.735	0.548	0.650	0.624	0.629	0.267	0.650

**Table 27: Module C4 LCA results based on EN15804+A2
Resource use indicators for 1 m² of APL windows and doors**

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
PERE	MJ	0.644	0.622	0.567	0.608	0.541	0.490	0.485	
PERM	MJ	0	0	0	0	0	0	0	
PERT	MJ	0.644	0.622	0.567	0.608	0.541	0.490	0.485	
PENRE	MJ	4.41	4.23	3.90	4.12	3.71	3.37	3.34	
PENRM	MJ	0	0	0	0	0	0	0	
PENRT	MJ	4.41	4.23	3.90	4.12	3.71	3.37	3.34	
SM	kg	0	0	0	0	0	0	0	
RSF	MJ	0	0	0	0	0	0	0	
NRSF	MJ	0	0	0	0	0	0	0	
FW	m3	0.00107	0.00104	9.45E-04	0.00102	9.02E-04	8.15E-04	8.08E-04	

**Table 28: Module C4 LCA results based on EN15804+A2 Waste material
and output flow indicators for 1 m² of APL windows and doors**

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
HWD	kg	2.33E-10	2.22E-10	2.07E-10	2.15E-10	1.96E-10	1.78E-10	1.77E-10	
NHWD	kg	20.4	20.2	17.8	19.9	17.1	15.4	15.2	
RWD	kg	4.62E-05	4.51E-05	4.05E-05	4.42E-05	3.88E-05	3.50E-05	3.47E-05	
CRU	kg	0	0	0	0	0	0	0	
MFR	kg	3.22	10.3	9.86	8.75	6.50	8.45	8.59	
MER	kg	0	0	0	0	0	0	0	
EEE	MJ	0.106	0.0703	0.106	0.0601	0.0902	0.0902	0.0902	
EET	MJ	0	0	0	0	0	0	0	

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	0.637	0.588	0.594	0.592	0.551	0.500	0.510	0.525	0.550
	0	0	0	0	0	0	0	0	0
	0.637	0.588	0.594	0.592	0.551	0.500	0.510	0.525	0.550
	4.37	4.00	4.08	4.02	3.77	3.44	3.50	3.50	3.77
	0	0	0	0	0	0	0	0	0
	4.37	4.00	4.08	4.02	3.77	3.44	3.50	3.50	3.77
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0.00106	9.84E-04	9.89E-04	9.94E-04	9.19E-04	8.34E-04	8.50E-04	8.89E-04	9.18E-04

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	2.31E-10	2.10E-10	2.16E-10	2.10E-10	1.99E-10	1.82E-10	1.85E-10	1.80E-10	1.99E-10
	20.2	19.0	18.7	19.3	17.4	15.7	16.1	17.9	17.4
	4.57E-05	4.25E-05	4.25E-05	4.30E-05	3.95E-05	3.58E-05	3.65E-05	3.89E-05	3.95E-05
	0	0	0	0	0	0	0	0	0
	3.53	11.2	12.4	10.1	7.97	10.4	10.9	5.07	6.81
	0	0	0	0	0	0	0	0	0
	0.106	0.0703	0.106	0.0601	0.0902	0.0902	0.0902	0	0.0902
	0	0	0	0	0	0	0	0	0

D Module

Table 29: Module D LCA results based on EN15804+A2 core environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
GWP	kg CO ₂ -eq.	-17.4	-55.9	-50.5	-47.3	-32.6	-42.9	-44.6	
GWPf	kg CO ₂ -eq.	-17.4	-55.8	-50.5	-47.3	-32.6	-42.9	-44.5	
GWPb	kg CO ₂ -eq.	-0.0126	-0.0404	-0.0364	-0.0342	-0.0233	-0.0308	-0.0321	
GWP _{luluc}	kg CO ₂ -eq.	-6.06E-04	-0.00194	-0.00177	-0.00165	-0.00115	-0.00151	-0.00156	
ODP	kg CFC11-eq.	-6.82E-12	-2.19E-11	-1.96E-11	-1.85E-11	-1.25E-11	-1.65E-11	-1.73E-11	
AP	Mole of H+ eq.	-0.113	-0.362	-0.327	-0.307	-0.211	-0.278	-0.288	
EP _{fw}	kg P eq.	-3.56E-06	-1.14E-05	-1.03E-05	-9.68E-06	-6.66E-06	-8.78E-06	-9.12E-06	
EP _m	kg N eq.	-0.00731	-0.0234	-0.0212	-0.0199	-0.0137	-0.018	-0.0187	
EP _t	Mole of N eq.	-0.0801	-0.257	-0.232	-0.218	-0.150	-0.198	-0.205	
POCP	kg NMVOC eq.	-0.0261	-0.0836	-0.0756	-0.0708	-0.0488	-0.0643	-0.0667	
ADP _m	kg Sb-eq.	-6.71E-06	-2.15E-05	-1.94E-05	-1.82E-05	-1.25E-05	-1.65E-05	-1.71E-05	
ADP _f	MJ	-128	-410	-371	-348	-239	-315	-327	
WDP	m ³ world equiv.	-5.80	-18.6	-16.8	-15.8	-10.8	-14.3	-14.8	

Table 30: Module D LCA results based on EN15804+A2 Additional environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
PM	Disease incidences	-2.34E-06	-7.52E-06	-6.79E-06	-6.37E-06	-4.38E-06	-5.77E-06	-5.99E-06	
IRP	kBq U235 eq.	-0.218	-0.699	-0.631	-0.593	-0.406	-0.535	-0.557	
ETP- _{fw}	CTUe	-49.7	-159	-144	-135	-92.8	-122	-127	
HTP-c	CTUh	-1.38E-08	-4.42E-08	-4.01E-08	-3.75E-08	-2.59E-08	-3.41E-08	-3.53E-08	
HTP-nc	CTUh	-1.33E-07	-4.26E-07	-3.85E-07	-3.61E-07	-2.48E-07	-3.27E-07	-3.40E-07	
SQP	Pt	-4.42	-14.2	-12.8	-12.0	-8.19	-10.8	-11.3	
IPCC AR5 GWP100	kg CO ₂ -eq.	-17.5	-56.2	-50.8	-47.6	-32.8	-43.2	-44.8	

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	-19.1	-60.9	-63.7	-54.9	-41.1	-54.3	-56.9	-27.5	-36.8
	-19.1	-60.8	-63.6	-54.8	-41.0	-54.2	-56.9	-27.4	-36.8
	-0.0138	-0.044	-0.0448	-0.0397	-0.0296	-0.0392	-0.0403	-0.0199	-0.0266
	-6.65E-04	-0.00212	-0.00234	-0.00191	-0.00144	-0.0019	-0.00206	-9.55E-04	-0.00128
	-7.48E-12	-2.38E-11	-2.32E-11	-2.15E-11	-1.60E-11	-2.11E-11	-2.12E-11	-1.08E-11	-1.44E-11
	-0.124	-0.394	-0.410	-0.355	-0.266	-0.351	-0.367	-0.178	-0.238
	-3.91E-06	-1.25E-05	-1.30E-05	-1.12E-05	-8.40E-06	-1.11E-05	-1.16E-05	-5.62E-06	-7.53E-06
	-0.00802	-0.0255	-0.0268	-0.023	-0.0172	-0.0228	-0.0239	-0.0115	-0.0155
	-0.0879	-0.280	-0.294	-0.252	-0.189	-0.250	-0.262	-0.126	-0.169
	-0.0286	-0.0911	-0.0955	-0.0821	-0.0615	-0.0812	-0.0853	-0.0411	-0.0551
	-7.36E-06	-2.34E-05	-2.43E-05	-2.11E-05	-1.58E-05	-2.09E-05	-2.18E-05	-1.06E-05	-1.42E-05
	-140	-447	-468	-403	-301	-398	-418	-202	-270
	-6.36	-20.3	-21.0	-18.3	-13.7	-18.1	-18.8	-9.14	-12.3

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	-2.57E-06	-8.19E-06	-8.52E-06	-7.38E-06	-5.52E-06	-7.30E-06	-7.62E-06	-3.70E-06	-4.95E-06
	-0.239	-0.762	-0.783	-0.687	-0.513	-0.679	-0.704	-0.344	-0.461
	-54.5	-174	-181	-156	-117	-155	-162	-78.3	-105
	-1.51E-08	-4.82E-08	-5.09E-08	-4.35E-08	-3.26E-08	-4.30E-08	-4.54E-08	-2.18E-08	-2.92E-08
	-1.46E-07	-4.64E-07	-4.85E-07	-4.18E-07	-3.13E-07	-4.14E-07	-4.33E-07	-2.09E-07	-2.81E-07
	-4.85	-15.4	-15.7	-13.9	-10.4	-13.7	-14.1	-6.97	-9.33
	-19.2	-61.2	-64.0	-55.2	-41.3	-54.6	-57.2	-27.6	-37.0

Table 31: Module D LCA results based on EN15804+A2
Resource use indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
PERE	MJ	-213	-682	-616	-578	-397	-523	-544	
PERM	MJ	0	0	0	0	0	0	0	
PERT	MJ	-213	-682	-616	-578	-397	-523	-544	
PENRE	MJ	-128	-410	-371	-348	-239	-316	-328	
PENRM	MJ	0	0	0	0	0	0	0	
PENRT	MJ	-128	-410	-371	-348	-239	-316	-328	
SM	kg	0	0	0	0	0	0	0	
RSF	MJ	0	0	0	0	0	0	0	
NRSF	MJ	0	0	0	0	0	0	0	
FW	m3	-0.674	-2.16	-1.95	-1.83	-1.26	-1.66	-1.72	

Table 32: Module D LCA results based on EN15804+A2
Waste material and output flow indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
HWD	kg	-6.50E-08	-2.08E-07	-1.88E-07	-1.77E-07	-1.21E-07	-1.60E-07	-1.66E-07	
NHWD	kg	-0.255	-0.818	-0.739	-0.693	-0.477	-0.629	-0.652	
RWD	kg	-0.00131	-0.00421	-0.00379	-0.00357	-0.00244	-0.00322	-0.00335	
CRU	kg	0	0	0	0	0	0	0	
MFR	kg	0	0	0	0	0	0	0	
MER	kg	0	0	0	0	0	0	0	
EEE	MJ	0	0	0	0	0	0	0	
EET	MJ	0	0	0	0	0	0	0	

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	-233	-743	-770	-670	-501	-662	-690	-335	-449
	0	0	0	0	0	0	0	0	0
	-233	-743	-770	-670	-501	-662	-690	-335	-449
	-140	-447	-468	-403	-302	-399	-418	-202	-271
	0	0	0	0	0	0	0	0	0
	-140	-447	-468	-403	-302	-399	-418	-202	-271
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	-0.74	-2.35	-2.44	-2.12	-1.59	-2.10	-2.19	-1.06	-1.42

	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	-7.13E-08	-2.27E-07	-2.35E-07	-2.05E-07	-1.53E-07	-2.02E-07	-2.11E-07	-1.02E-07	-1.37E-07
	-0.280	-0.891	-0.932	-0.803	-0.601	-0.795	-0.833	-0.402	-0.539
	-0.00144	-0.00459	-0.00469	-0.00414	-0.00309	-0.00408	-0.00422	-0.00207	-0.00277
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0

References

- CEN. (2013). *EN 15804:2012+A1:2013: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products*. Brussels: European Committee for Standardization.
- CEN. (2019). *EN 15804:2012+A2:2019: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products*. Brussels: European Committee for Standardization.
- CEN. (2020). *Windows and doors - Environmental Product Declarations - Product category rules for windows and pedestrian doorsets*. Brussels: European Committee for Standardization.
- EPD Australasia. (2019). *Instructions of the Australasian EPD Programme v3.0*. EPD Australasia.
- EPD International. (2020). *Complementary Product Category Rules (c-PCR) to PCR 2019:14*. EPD International.
- EPD International. (2021). PCR 2019:14, version 1.11 *Construction Products*. EPD International.
- IPCC. (2013). *Climate Change 2013: The Physical Science Basis*. Geneva: IPCC.
- ISO. (2006). *ISO 14025: Environmental labels and declarations – Type III environmental declarations – Principles and procedures*. Geneva: International Organization for Standardization.
- ISO. (2006a). *ISO 14044: Environmental management – Life cycle assessment – Principles and framework*. Geneva: International Organization for Standardization.
- ISO. (2006b). *ISO 14044: Environmental management – Life cycle assessment – Requirements and guidelines*. Geneva: International Organization for Standardization.
- Sphera. (2022). *GaBi Life Cycle Inventory Database 2022 Documentation*.
<https://gabi.sphera.com/support/gabi/gabi-database-2022-lci-documentation/>



Annex

EN15804+A1 Results

Potential environmental impact

Table 33: Module A1-A3 LCA results based on EN15804+A1
Environmental impact indicators for 1 m² of APL windows and doors

Abb.	Product	RT Awning Window	RT Sliding Window	RT Bi-fold Window	RT Sliding Door	RT Hinged Door	RT French Door	RT Bi-fold Door	
	Units								
GWP	kg CO ₂ -eq.	60.5	122	112	109	81.6	95.8	97.2	
ODP	kg CFC11-eq.	1.29E-10	3.36E-10	3.03E-10	2.90E-10	2.07E-10	2.60E-10	2.67E-10	
AP	kg SO ₂ -eq.	0.361	0.679	0.617	0.605	0.462	0.529	0.537	
EP	kg PO ₄ ³⁻ -eq.	0.0294	0.0382	0.0354	0.0359	0.0302	0.0306	0.0303	
POCP	kg C ₂ H ₄ -eq.	-0.00567	0.0200	0.0193	0.0144	0.00804	0.0164	0.0173	
ADPe	kg Sb-eq.	6.28E-05	9.23E-05	5.06E-04	8.36E-05	4.56E-04	4.85E-04	3.57E-04	
ADPf	MJ	658	1,160	1,060	1,040	805	910	918	



	MT Awning Window	MT Sliding Window	MT Bi-fold Window	MT Sliding Door	MT Hinged Door	MT French Door	MT Bi-fold Door	Comm Awning Window	Comm Hinged Door
	62.8	120	137	120	95.7	114	121	74.3	87.2
	1.38E-10	3.30E-10	3.88E-10	3.30E-10	2.54E-10	3.21E-10	3.43E-10	1.79E-10	2.29E-10
	0.372	0.662	0.745	0.662	0.532	0.624	0.655	0.423	0.490
	0.0295	0.0370	0.0401	0.0370	0.0322	0.0334	0.0345	0.029	0.0302
	-0.00433	0.0199	0.0283	0.0199	0.0133	0.0235	0.0254	0.00261	0.00977
	6.28E-05	7.62E-05	5.96E-04	7.62E-05	3.82E-04	4.13E-04	4.28E-04	6.17E-05	6.80E-05
	675	1,130	1,310	1,130	929	1,060	1,140	745	854



