

Environmental Product Declaration

In accordance with ISO 14025:2006
and EN 15804:2012+A2:2019/AC:2021



Commercial Aluminium Extrusion EPD

EPD of multiple products, based on the average results of the product group.
A full list of products covered by this EPD is presented within this document
on page 4.

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Declaration owner		Wight Aluminium Ltd 24 Mill Road, Whanganui 4501, New Zealand	www.wightaluminium.co.nz info@wightaluminium.co.nz
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Third party verifier:	Claudia A. Peña (Director of PINDA LCT SpA) pinda.lct@gmail.com		
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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 registered in different EPD programmes, or not compliant with EN 15804, may not be comparable.

For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g.

identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

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 this document to assist comparability across EPDs.



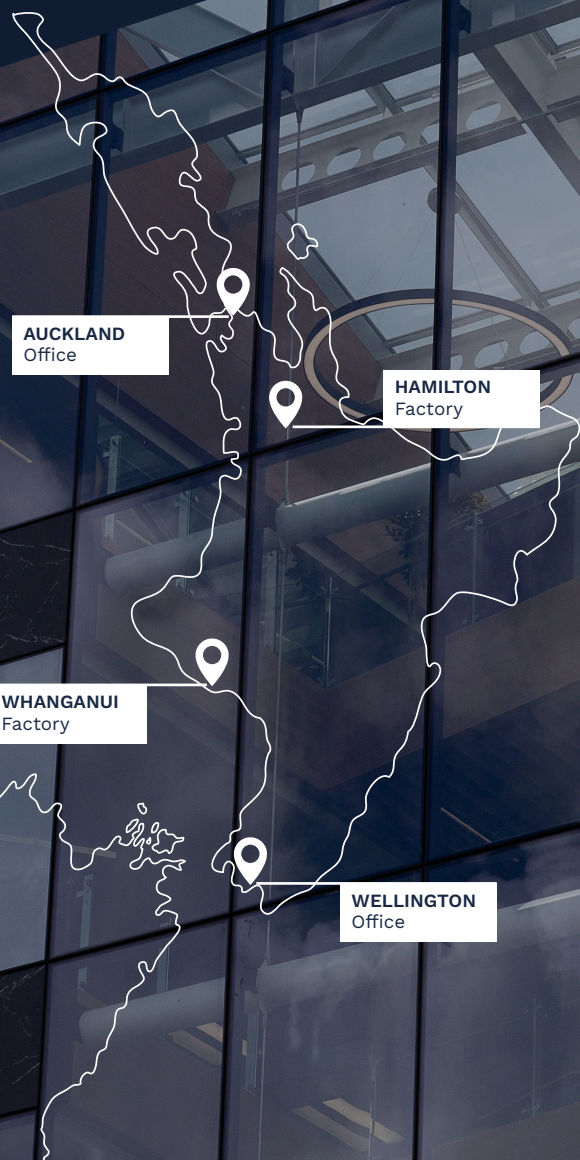
Wight Aluminium is a leading commercial façade provider in Aotearoa New Zealand. For over 50 years we've been delivering façade solutions that enhance New Zealand's built environment.

This EPD is our commitment to being part of the solution for a lower embodied carbon built environment.

We know that what we build now will influence New Zealand's carbon footprint for generations to come. In producing this EPD, we're providing high quality, comprehensive information to our project and industry partners, a strong foundation for informed decision making.

We provide full façade solutions – design, technical detailing, product manufacture and installation of curtain walls, window solutions and cladding – for commercial projects across New Zealand. Our two manufacturing facilities are located in Whanganui and Hamilton, with additional design and project management offices in Auckland and Wellington.

This EPD focuses on the aluminium extrusion used in our commercial suite products.



Commercial Aluminium Extrusion

Product Description

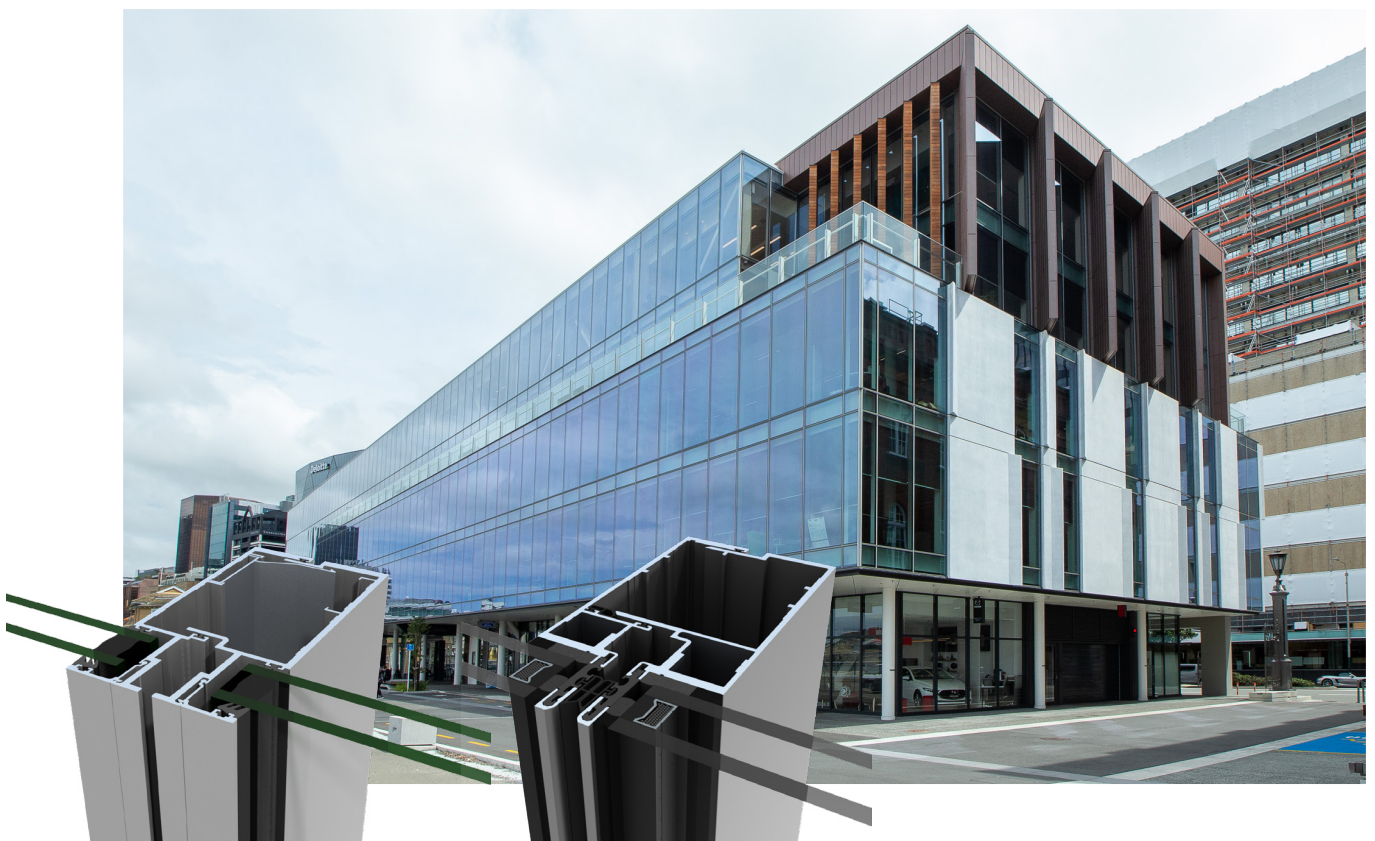
Wight Aluminium fabricates aluminium extrusion profiles into a range of products used in façade systems and building envelope solutions. This EPD focuses only on the aluminium extrusions that are used in façade systems designed for commercial project application.



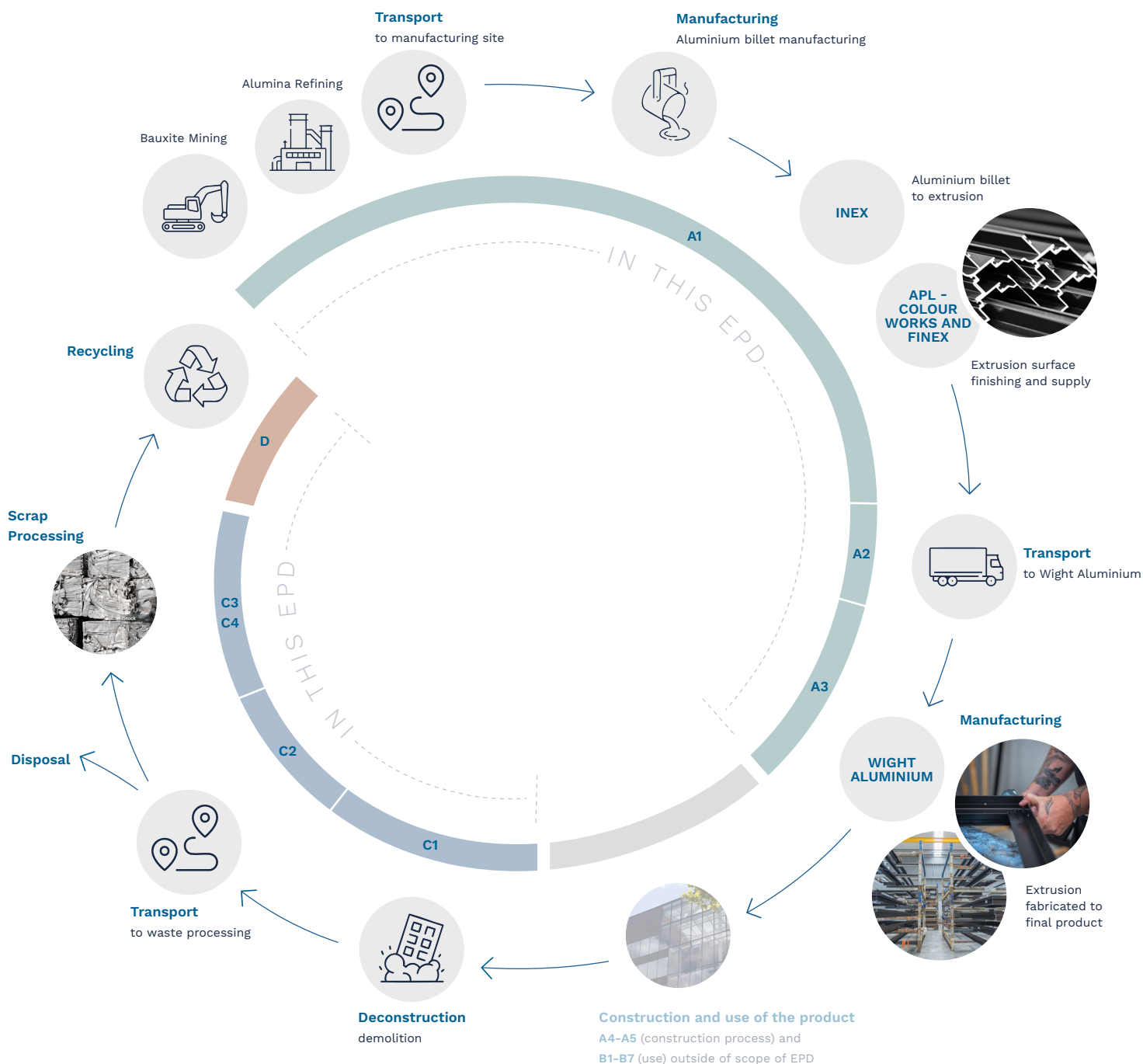
This is an EPD of multiple products, covering four products:

- Powder coated extruded aluminium profile fabricated at Wight Aluminium's Whanganui Factory
- Anodised extruded aluminium profile fabricated at Wight Aluminium's Whanganui Factory
- Powder coated extruded aluminium profile fabricated at Wight Aluminium's Hamilton Factory
- Anodised extruded aluminium profile fabricated at Wight Aluminium's Hamilton Factory

The EPD presents weighted average results based on sales volume for the 2023 calendar year (CY2023, 1 Jan to 31 Dec 2023).



Product Life Cycle



INEX, APL, COLOUR WORKS AND FINEX

Wight Aluminium sources aluminium extrusions from INEX Ltd, a leading aluminium extrusion manufacturer in New Zealand. INEX sources predominantly local aluminium billet with some international supply, and uses hydraulic extruders to produce its extrusion.

The aluminium extrusions are surface finished – either powder coated or anodised – at APL's dedicated surface finishing facilities, Colour Works Ltd and FINEX Ltd, before distributed to Wight Aluminium's manufacturing sites. Both Colour Works Ltd and FINEX are located on the same site as INEX.

WIGHT ALUMINIUM

In Wight Aluminium manufacturing, extrusions are cut to size and fabricated into curtain wall panels and/or commercial suite windows and doors, which can include fitting glass units and other window panels/door components (such as screws, rivets, gaskets/seals, and sealants), ready for installation to form a full window/door assembly, which is subsequently installed into commercial buildings.

This study focuses only on the extruded aluminium profiles used to fabricate windows and curtain wall panels for commercial applications.

Commercial Aluminium Extrusion

Declared Unit

The declared unit for the EPD is 1 kg of extruded aluminium profile, plus its packaging. The weight of the packaging is not included in the declared 1 kg of extruded aluminium profile.

Table 1: Industry Classification

Product	Classification	Code	Category
Extruded aluminium profiles	UN CPC Ver.2	42120	Doors, windows and their frames and thresholds for doors, of iron, steel or aluminium
	ANZSIC 2006	2223	Architectural Aluminium Product Manufacturing

Table 2: Technical Specifications Applying to the Products in this EPD

Product group	Relevant standards
Extruded aluminium profiles	NZS 4211: Specification for performance of windows (incl. serviceability, deflection, operation of opening sashes, air infiltration, water penetration, ultimate strength, torsional strength of sashes)
	NZS 4284: Testing of Building Facades (incl. serviceability deflection, air infiltration, water penetration, ultimate strength, seismic, seal degradation)
	AS 3715:2002 Metal finishing—Thermoset powder coatings for architectural applications of aluminium and aluminium alloys
	SFA 3503-03:2005 Specification for Anodic Oxide Coatings on Wrought Aluminium for External Architectural Applications

Content Declaration

The content declaration for this EPD of multiple products is based on the average results of the product group.

Table 3: Content Declaration of 1 kg of Wight Aluminium Extrusion (weighted average across powder coated and anodised)

Product components	Weight, kg	Post-consumer recycled material, weight-% of product	Biogenic material, weight-% of product	Biogenic material, kg C/kg of product
Aluminium extrusions	0.940 (0.934-0.968)	0*	0	0
Coating	0.0602 (0.032-0.066)	0	0	0
Total	1	0	0	0

* While aluminium billet produced at NZAS requires no scrap input, aluminium production in Middle East might use post-consumer scrap input. However, this information was not readily available – hence assumed zero.

Table 4: Content Declaration of 1 kg of Wight Aluminium Extrusion (powder coated)

Product components	Weight, kg	Post-consumer recycled material, weight-%	Biogenic material, weight-% and kg C/kg
Aluminium extrusions	0.934	0*	0 resp. 0
Coating	0.066	0	0 resp. 0
<i>Powder coat paint</i>	0.052	0	0 resp. 0
<i>Gardacid</i>	0.00434	0	0 resp. 0
<i>Gardobond</i>	0.00334	0	0 resp. 0
<i>Metal etch</i>	0.00214	0	0 resp. 0
<i>Oxsilan</i>	1.65E-04	0	0 resp. 0
<i>Oxsilan additive</i>	8.12E-05	0	0 resp. 0
<i>Oxsilan AL</i>	1.30E-04	0	0 resp. 0
<i>Phosystem</i>	6.82E-06	0	0 resp. 0
<i>Caustic soda (50%)</i>	0.00299	0	0 resp. 0
<i>Dispozaid flocculant</i>	1.34E-07	0	0 resp. 0
<i>Hydrochloric acid (33%)</i>	0.001	0	0 resp. 0
<i>Gardacid</i>	0.00434	0	0 resp. 0
Total	1	0	0 resp. 0

* While aluminium billet produced at NZAS requires no scrap input, aluminium production in Middle East might use post-consumer scrap input. However, this information was not readily available – hence assumed zero.

Commercial Aluminium Extrusion

Table 5: Content Declaration of 1 kg of Wight Aluminium Extrusion (anodised)

Product components	Weight, kg	Post-consumer recycled material, weight-%	Biogenic material, weight-% and kg C/kg declared unit
Aluminium extrusion	0.968	0*	0 resp. 0
Coating	0.032	0	0 resp. 0
<i>Stannous sulphate powder</i>	0.00505	0	0 resp. 0
<i>Gardocolor</i>	0.00289	0	0 resp. 0
<i>Gardoseal</i>	0.0190	0	0 resp. 0
<i>Superseal</i>	0.00551	0	0 resp. 0
Total	1	0	0 resp. 0

* While aluminium billet produced at NZAS requires no scrap input, aluminium production in Middle East might use post-consumer scrap input. However, this information was not readily available – hence assumed zero.

Table 6: Composition of Packaging per 1 kg of Wight Aluminium Extrusion (powder coated/anodised)

Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/declared unit
Timber pallet	0.0172	1.72	0.00791
Cardboard	0.00405	0.405	0.00186
Polyethylene (PE) film and bag	0.00321	0.321	0
Polystyrene (PS) foam	9.50E-05	0.00950	0
Polyethylene terephthalate (PET) strapping	4.97E-04	0.0497	0
Total	0.0250	2.50	0.00977

Dangerous substances from the candidate list of SVHC for Authorisation

The products declared within this EPD

- Do not release dangerous substances to soil and water
- Do not contain hazardous substances requiring labelling
- Do not contain materials identified in the European Chemicals Agency's Candidate List of Substances of Very High Concern in the products at a concentration greater than 0.1% (ECHA, 2022)

Commercial Aluminium Extrusion

System Boundaries

As shown in the table below, this EPD is of the type 'cradle to gate with Modules C1-C4 and Module D (A1-A3 + C + D)' (type a). Other life cycle stages (Modules A4-A5, B1-B7) are dependent on particular scenarios and best modelled at the building level.

Table 7: Modules Included in the Scope of the EPD

	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
Share of specific data	69%*			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation: products	10.7%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation: sites	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = included in the EPD; ND = Module not declared (such a declaration shall not be regarded as an indicator result of zero)

* This includes upstream INEX extrusion operations, aluminium extrusion transport between INEX and Wight Aluminium, fabrication processes and product packaging. Share of specific data is calculated based on the GWP-GHG results.

The processes below are included in the product system to be studied. For modules beyond A3, the scenarios included are currently in use and are representative for one of the most probable alternatives.

Product Stage (Modules A1-A3)

The production stage covers the extraction and processing of raw materials, transport to manufacturing sites and manufacturing processes of extruded aluminium profiles. Packaging of extruded aluminium profiles is also included.

- Aluminium billet production. INEX sources aluminium billet from both local and overseas suppliers.
- Aluminium billets are transported to the INEX manufacturing facility in Hamilton (New Zealand).
- Extrusion press operation. Aluminium billets are cut into smaller lengths and heated via electric induction oven. Billets are then loaded into a chamber and pushed at force through extrusion press (hydraulic extruders) to form aluminium extrusion profiles.
- Surface finishing. INEX aluminium extrusion profiles undergo a surface finishing process, which can be either powder coating or anodising. Powder coating and anodising are undertaken at Colour Works Ltd and FINEX Ltd, respectively. Both facilities are part of Profile Group and located on the same site as INEX.
- 100% of INEX and APL's electricity consumption is covered via New Zealand Energy Certificate System.
- Packaging of INEX and APL aluminium extrusion profiles.
- Transport of INEX aluminium extrusions to Wight Aluminium manufacturing sites in Whanganui and Hamilton.

Wight Aluminium's manufacturing process

- Cutting of INEX aluminium extrusion profiles to desired length and fabricating curtain wall panels, window and door frames according to the requirements of clients.
- 100% of Wight Aluminium's electricity consumption is covered via New Zealand Energy Certificate System.
- Packaging of Wight Aluminium extruded aluminium profiles. Note that Wight Aluminium reuses the packaging materials that come with INEX aluminium extrusions and only sources virgin packaging materials if required.

Modules A1-A3 include the generation and transmission of electricity generation of thermal energy from natural gas and liquid petroleum gas, supply of water, and solid waste and wastewater management.

Profile Group is the parent company to INEX, Colour Works and FINEX. 100% of Profile Group's and Wight Aluminium's electricity consumption is covered via New Zealand Energy Certificate System (NZECS). These NZECS certificates were generated by Kawatiri Energy - one of New Zealand's newest hydroelectricity projects which generates hydropower from the Lake Rochfort Scheme near Westport (APL Window Solutions, 2024).

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

When a building reaches its end-of-life it will be demolished and the demolition waste transported to a processing facility. The waste processing includes the separation of aluminium waste from other building materials and shredding activities. Material that cannot be recycled will be disposed. The end-of-life stage (Modules C1-C4) is modelled using a scenario reflecting end-of-life recycling/ landfilling rates for metal products in the construction sector, according to BRANZ (2024).

The end-of-life stage (Modules C1-C4) covers the following:

- Module C1 (deconstruction/demolition) includes demolition of the whole building including aluminium extrusion profiles (in windows/doors) using mass allocation, based on a 100-kW construction excavator.
- Module C2 (transport to end-of-life) includes transport of waste aluminium extrusions to waste management facilities, following building demolition.
- Module C3 (waste processing) includes the processing of waste aluminium extrusions for reuse or recycling.
- Module C4 (disposal) includes aluminium extrusions end-of-life which is a combination of landfill and recycling.

Table 8: End-of-life Scenarios for Products Considered in this EPD

Process	Unit (expressed per declared unit of extruded aluminium profile)
Excavator	1 kg collected separately
Recovery system specified by type	0% for re-use
	85% of metals for recycling (BRANZ, 2024)
	0% for energy recovery
Disposal specified by type	15% of metals modelled as ferrous metals in landfill (BRANZ, 2024)
Assumptions for scenario development	C1 – demolishing with an Excavator (100kW); fuel consumption is calculated at 0.172 kg diesel input per tonne of material
	C2 – 50 km of transport by truck with a utilisation rate of 50%
	C3 – waste processing for recycling
	C4 – 15% of aluminium is landfilled

The European Union Guidance on PEF identifies an R2 value of 95% for aluminium products in EU (European Commission, 2020). In this study, we have used 85% which correctly reflects the New Zealand context (BRANZ, 2024). A recycling yield (Y) of 95% is used.

Recovery and Recycling Potential (Module D)

Benefits and loads beyond system boundary (Module D) include recovered aluminium scraps that are fed into a second life cycle. This Module is modelled considering the avoided virgin aluminium production in New Zealand.

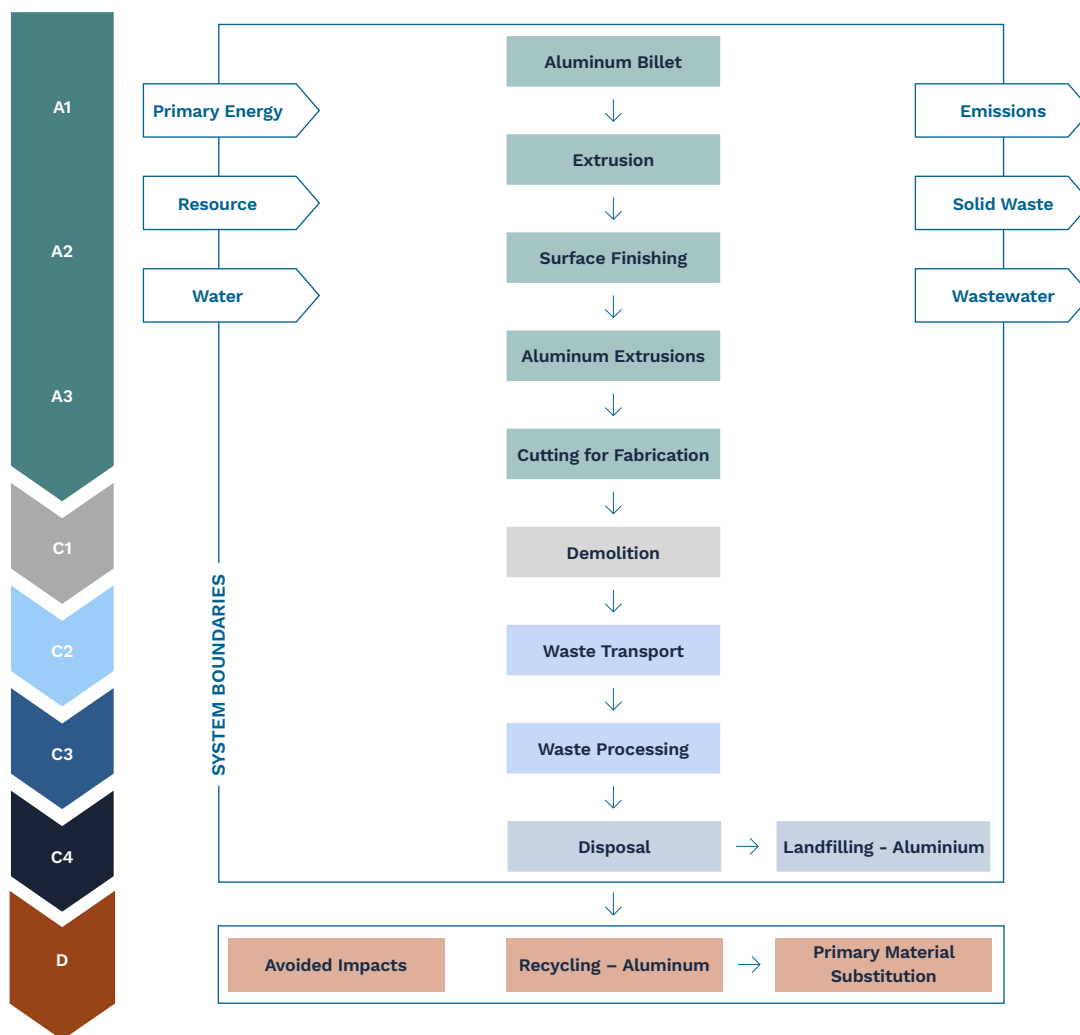


Figure 2: High-level Processes for Wight Aluminium Products (A1-A3, C1-C4 and D)

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, surface finishing, transport of surface finished extrusions to manufacturing sites and fabrication processes, for CY2023.

Background data was used for input materials sourced from other suppliers such as packaging materials.

Overseeing and managing the data collection for Wight Aluminium was Kate Bellis – Brand and Communication Manager.

Upstream Data

Aluminium extrusions

INEX produces aluminium extrusion profiles using aluminium billets sourced from New Zealand and overseas suppliers.

Surface finishing

INEX aluminium extrusion profiles undergo a surface finishing process, which can be either powder coating or anodising. Powder coating and anodising are undertaken at Colour Works Ltd and FINEX Ltd, respectively.

LCA Software and Database

The underlying LCA model was developed according to the ISO standards for LCA (ISO, 2006a, 2006b), using the Life Cycle for Experts (LCA FE) (formerly known as GaBi Software) for life cycle engineering (version 10.9.0.31), developed by Sphera Solutions, Inc.

Data for all energy inputs, transport processes and raw materials are from the Managed LCA Content (MLC) Database 2024.2 (Sphera, 2024). The reference year for the data ranges from 2015 to 2023 and therefore, all datasets are within the 10-year limit allowable for generic data under EN 15804 and the PCR.

Electricity

100% of Profile Group's and Wight Aluminium's electricity consumption is covered via New Zealand Energy Certificate System (NZECS). These NZECS certificates were generated by Kawatiri Energy - one of New Zealand's newest hydroelectricity projects which generates hydropower from the Lake Rochfort Scheme near Westport (APL Window Solutions, 2024). Wight Aluminium has committed to source NZECS Certificates for the next six months and beyond.

The emission factor for the New Zealand hydroelectricity (including transmission and distribution losses) for the GWP-GHG indicator is 0.00769 kg CO₂-eq./kWh (based on EF3.1).

Location-based grid mix emission factors (using the published grid mix) are used for other electricity consumption including Modules C1-C4 and D.

Recycling and Recycled Inputs

Benefits from recycling the recovered aluminium in Module C4 are considered in Module D; for aluminium, a recycling rate of 85% is considered and 15% is landfilled (BRANZ, 2024).

Aluminium credits are modelled as avoided burdens of virgin aluminium produced in New Zealand, considering recycling efficiency. This leads to recycling credits being lower than the impact of virgin production.

Transport

Primary transport data was used for transport of production inputs (A2). Any wastes from the production process (A3) are assumed to be transported over a 50 km distance to a treatment or disposal site. Transport modes: Truck (diesel), Euro 0 - 6 mix, 34 - 40 t gross weight / 27 t payload capacity.

Container ship (heavy fuel oil), 5 000 to 200 000 dwt payload capacity, ocean going.

Explanation of Average Products & Variation

This is an EPD of multiple products (four products in total): powder coated and anodised extruded aluminium profiles manufactured at two sites. The results were calculated for individual products and weighted based on the sales volume for CY2023. The variation for the GWP-GHG indicator results is 10.7% across Modules A1-A3.

Cut-off Criteria

thinkstep-anz consistently excludes environmental impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the foreground production process, ('capital goods') regardless of potential significance.

Infrastructure/capital goods are excluded from all MLC datasets. An important exception is the inclusion of capital goods for electricity generation, where the capital goods are very important for modelling of changes towards more renewable generation. Capital goods related to electricity generation are included in all MLC electricity datasets.

Note: The system boundaries on manufacturing of equipment and for employees are not regarded as limiting the scope of the inventory or as an incomplete inventory (i.e. a cut-off).

Cut-off criteria were applied to the following:

- Cut-off was applied to the volatile organic compounds (VOCs) released to air during the powder coating process, due to data unavailability.
- Cut-off was applied to the packaging materials given most of them are reused or sent for recycling.

The effects of the exclusions are minimal (meeting the <1% flow exclusion criteria), given the impacts of Wight Aluminium products are largely driven by upstream aluminium billet production.

Allocation

Allocation of co-products

Following the requirements of PCR 2019:14 v1.3.4 section 4.5.1 (EPD International, 2024), co-product allocation was applied for manufacturing processes that involve aluminium and scraps, which have economic values. In this study, aluminium extrusion and aluminium scrap are treated as product and co-product, respectively.

- Aluminium scrap is generated during aluminium profile extrusion (at INEX) and fabrication (Module A3). The aluminium scrap is subsequently sold to a recycler, which has an economic value compared to the main product.
- Economic data supplied by INEX for the 2023/24 financial year was used.
- Site overheads (e.g. water, wastewater, fuels, electricity, and waste) are allocated based on the economic values of the product and scrap.
- Packaging materials are allocated by mass across the total output of packaged extruded aluminium profiles.

Allocation of waste

The allocation of waste follows the "polluter-pays" principle, as outlined in PCR 2019:14 v1.3.4 section 4.5.2 (EPD International, 2024).

Packaging waste materials that are sent for landfill reaches their end-of-waste state once they reach the landfill. The transport to the landfill is accounted for.

End-of-life Allocation

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

Material recycling (avoided burden approach): Open scrap inputs from the production stage are subtracted from scrap to be recycled at end-of-life to give the net scrap output from the product life cycle. This remaining net scrap is sent to material recycling. Credits are assigned at Module D based on the potential benefit of recovering the secondary material in substitution for primary material production. If net scrap is negative (e.g. the production stage scrap inputs are higher than the scrap available for recycling at end-of-life), Module D will assign a burden. The Module D impacts are modelled using industry average inventories.

Landfilling (avoided burden approach): In cases where materials are sent to landfills, they are linked to an inventory that accounts for waste composition, regional leachate rates, landfill gas capture as well as utilisation rates (flaring vs. power production).

Commercial Aluminium Extrusion

Assumptions

Few assumptions were made during the LCI collection and modelling process are as follows:

- Cut-off criteria, as per the PCR 2019:14 version 1.3.4 (EPD International, 2024), are reasonable in the context of the overall impacts of Wight Aluminium extruded aluminium profiles.
- Where specific life cycle inventory data were unavailable, proxy data were used, giving preference to regional data.
- Use of any required secondary data from outside New Zealand is sufficiently representative of the impacts of the material. Where the geography is expected to have an impact on the results, this is indicated as a geographical proxy.
- Average utility impact is based on the utility data and total production for CY2023.

Sensitivity Analysis

A sensitivity analysis was undertaken to understand the effect of price change for both aluminium extrusion and scrap produced at INEX. A $\pm 20\%$ price change in aluminium extrusion and scrap showed little effects on the overall impacts of the aluminium extrusion produced at INEX (up to 2.17%). However, it is essential to monitor these effects continuously.

Data Quality Assessment

Primary data for aluminium extrusion, surface finishing, transport to fabrication sites and fabrication was sourced for CY2023.

This study utilises the system for “Data quality level and criteria of the UN Environment Global Guidance on LCA database development” (CEN, 2019).



Table 9: Data Quality Assessment

Material/Life cycle stage	Collected foreground data	Data Source and Year	Representativeness		
			Geographical	Technological	Time
Al Extrusions (A1-A3)	Raw materials and suppliers, land use, manufacturing processes, energy and water use, production volumes, transport modes and distances	Supplied by INEX, for CY2023	Very Good	Very Good	Very Good
Powder Coating (A1-A3)	Raw materials and suppliers, land use, manufacturing processes, energy and water use, production volumes, transport modes and distances	Supplied by Colour Works, for CY2023	Very Good	Very Good	Very Good
Anodising (A1-A3)	Raw materials and suppliers, land use, manufacturing processes, energy and water use, production volumes, transport modes and distances	Supplied by FINEX, for CY2023	Very Good	Very Good	Very Good
Fabrication (A1-A3)	Raw materials and suppliers, land use, manufacturing processes, energy and water use, production volumes, transport modes and distances	Supplied by Wight Aluminium, for CY2023	Very Good	Very Good	Very Good
Module C1	Inputs for deconstruction & demolition	Assumptions for deconstruction energy	Fair	Good	Fair
Module C2	Transport modes and distances to end-of-life destinations	General assumption	Fair	Fair	Fair
Module C3	Inputs for waste processing including aluminium recovery rate	(BRANZ, 2024)	Good	Fair	Fair
Module C4	End-of-life destinations	(BRANZ, 2024)	Fair	Fair	Fair
Module D	Inputs for aluminium scrap recycling	Assumptions for recycling and credits	Good	Fair	Fair

Commercial Aluminium Extrusion

Assessment Indicators

The results tables describe the different environmental indicators for each product per declared unit, for each declared module. The EN 15804 reference package based on EF 3.1 is used.

Table 10 contains the core environmental impact indicators in accordance with EN 15804:2012+A2:2019, describing the potential environmental impacts of the product.

Table 11 shows the life cycle inventory indicators for resource use.

Table 12 displays the life cycle inventory indicators for waste and other outputs.

Table 13 provides additional environmental impact indicators in accordance with EN 15804:2012+A2:2019.

Table 14 displays biogenic carbon content indicators.

Table 15 contains results for environmental impact indicators in accordance with EN 15804:2012+A1:2013 to aid backward comparability. Results using

the indicators and characterisation factors of EN15804+A1 are included to aid comparison and backwards compatibility with rating tools. While the indicators and characterisation methods are from EN 15804:2012+A1:2013, other LCA rules for the study (such as system boundaries and allocation) are according to EN 15804:2012+A2:2019; i.e., this study does not claim that the results of the “+A1 indicators” are compliant with EN 15804:2012+A1:2013.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

The use of primary energy is separated into energy used as raw material and energy used as energy carrier as per option C in Annex 3 in the PCR (EPD International, 2024)

Energy indicators (MJ) are always given as net calorific value.

Table 10: EN15804+A2 Core Environmental Impact Indicators

Impact category	Indicator	Unit
Climate change – total	GWP-total	kg CO ₂ -eq.
Climate change – fossil	GWP-fossil	kg CO ₂ -eq.
Climate change – biogenic	GWP-biogenic	kg CO ₂ -eq.
Climate change – land use and land use change	GWP-luluc	kg CO ₂ -eq.
Ozone depletion	ODP	kg CFC11-eq.
Acidification	AP	Mole of H ⁺ eq.
Eutrophication aquatic freshwater	EP-freshwater	kg P eq.
Eutrophication aquatic marine	EP-marine	kg N eq.
Eutrophication terrestrial	EP-terrestrial	Mole of N eq.
Photochemical ozone formation	POCP	kg NMVOC eq.
Depletion of abiotic resources – minerals and metals ¹	ADP-m&m	kg Sb-eq.
Depletion of abiotic resources – fossil fuels ¹	ADP-fossil	MJ
Water use ¹	WDP	m ³ world equiv.

Table 11: Life Cycle Inventory Indicators on Use of Resources

Parameter	Indicator	Unit
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ
Use of renewable primary energy resources used as raw materials	PERM	MJ
Total use of renewable primary energy resources	PERT	MJ
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ
Total use of non-renewable primary energy resources	PENRT	MJ
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ
Use of non-renewable secondary fuels	NRSF	MJ
Net use of fresh water	FW	m ³

Table 12: Life Cycle Inventory Indicators on Waste Categories and Output Flows

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

Table 13: EN15804+A2 Additional Environmental Impact Indicators

Impact Category	Indicator	Unit
Climate Change ²	GWP-GHG	kg CO ₂ -eq.
Climate Change ³	GWP-GHG (IPCC AR5)	kg CO ₂ -eq.
Particulate Matter emissions	PM	Disease incidences
Ionising Radiation – human health ⁴	IRP	kBq U235 eq.
Eco-toxicity (freshwater) ¹	ETP-fw	CTUe
Human Toxicity, cancer ¹	HTP-c	CTUh
Human Toxicity, non-cancer ¹	HTP-nc	CTUh
Land use related impacts / soil quality ¹	SQP	Dimensionless

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Table 14: Biogenic Carbon Content Indicators

Parameter	Indicator	Unit
Biogenic carbon content - product	BCC-prod	kg C
Biogenic carbon content - packaging	BCC-pack	kg C

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂

Table 15: EN15804+A1 Environmental Impact Indicators

Impact Category	Indicator	Unit
Global warming potential	GWP (EN15804+A1)	kg CO ₂ -eq.
Ozone depletion potential	ODP (EN15804+A1)	kg CFC11-eq.
Acidification potential	AP (EN15804+A1)	kg SO ₂ -eq.
Eutrophication potential	EP (EN15804+A1)	kg PO ₄ ³⁻ -eq.
Photochemical ozone creation potential	POCP (EN15804+A1)	kg C ₂ H ₄ -eq.
Abiotic depletion potential for non-fossil resources	ADPE (EN15804+A1)	kg Sb-eq.
Abiotic depletion potential for fossil resources	ADPF (EN15804+A1)	MJ

Disclaimers

¹The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

²This indicator is identical to GWP-total except that the characterisation factor for biogenic CO₂ is set to zero. It has been included in the EPD following the PCR.

³GWP-GHG (IPCC AR5) is an additional GWP100 indicator that is aligned with the Intergovernmental Panel on Climate Change (IPCC) 2013 Fifth Assessment Report (AR5) (IPCC 2013), national greenhouse gas reporting frameworks in Australia and New Zealand and previous versions of the Construction Products PCR (PCR2019:14v1.11). It excludes biogenic carbon and indirect radiative forcing.

⁴This 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 also not measured by this indicator.

Environmental Performance

The following tables show the results for one declared unit of extruded aluminium profiles.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Table 16: EN15804+A2 Core Environmental Impact Indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D	A-C Variation
GWP-total	kg CO ₂ -eq.	9.48E+00	6.76E-04	4.60E-03	2.80E-03	2.27E-03	-4.35E+00	10.9%
GWP-fossil	kg CO ₂ -eq.	9.46E+00	6.70E-04	4.59E-03	2.73E-03	2.24E-03	-4.35E+00	10.5%
GWP-biogenic	kg CO ₂ -eq.	1.66E-02	5.50E-06	6.15E-07	2.04E-05	7.14E-06	0.00E+00	238%
GWP-luluc	kg CO ₂ -eq.	1.41E-03	1.75E-08	1.21E-07	4.10E-05	1.35E-05	-2.72E-04	6.13%
ODP	kg CFC ₁₁ -eq.	8.78E-12	6.68E-17	4.60E-16	8.46E-15	6.06E-15	-5.28E-12	7.11%
AP	Mole of H ⁺ eq.	5.25E-02	3.49E-06	1.17E-05	1.32E-05	1.59E-05	-2.97E-02	4.65%
EP-freshwater	kg P eq.	1.21E-05	1.03E-10	7.06E-10	7.65E-09	5.10E-09	-1.05E-06	298%
EP-marine	kg N eq.	8.80E-03	1.70E-06	5.18E-06	6.13E-06	4.10E-06	-2.87E-03	12.8%
EP-terrestrial	Mole of N eq.	9.59E-02	1.86E-05	5.69E-05	6.79E-05	4.52E-05	-3.15E-02	11.4%
POCP	kg NMVOC eq.	2.65E-02	4.79E-06	1.24E-05	1.69E-05	1.26E-05	-9.45E-03	9.76%
ADP-m&m	kg Sb-eq.	7.00E-07	8.79E-12	6.05E-11	3.01E-09	1.45E-10	-3.91E-07	25.1%
ADP-fossil	MJ	1.10E+02	8.82E-03	6.07E-02	4.92E-02	2.96E-02	-3.91E+01	14.61%
WDP	m ³ world equiv.	2.78E+00	2.51E-06	1.73E-05	4.57E-04	2.57E-04	-1.64E+00	29.6%

Table 17: Use of Resources

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	8.26E+01	3.81E-05	2.62E-04	6.88E-03	5.17E-03	-5.60E+01
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	8.26E+01	3.81E-05	2.62E-04	6.88E-03	5.17E-03	-5.60E+01
PENRE	MJ	1.10E+02	8.82E-03	6.07E-02	4.92E-02	2.96E-02	-3.91E+01
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.10E+02	8.82E-03	6.07E-02	4.92E-02	2.96E-02	-3.91E+01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FWT	m ³	2.93E-01	5.11E-08	3.51E-07	1.43E-05	7.85E-06	-1.79E-01

Since Module C is included in the EPD, the use of Module A1-A3 results without considering the results of Module C is discouraged.

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Table 18: Waste Production and Output Flows

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
HWD	kg	4.20E-07	1.42E-13	9.77E-13	1.04E-11	7.38E-12	1.02E-08
NHWD	kg	4.59E+00	2.16E-07	1.49E-06	1.47E-05	1.50E-01	-2.83E+00
RWD	kg	6.08E-04	1.72E-09	1.18E-08	3.85E-07	3.12E-07	-1.44E-04
CRU	kg	1.49E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	3.04E-01	0.00E+00	0.00E+00	8.50E-01	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 19: EN15804+A2 Additional Environmental Impact Indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG	kg CO ₂ -eq.	9.48E+00	6.71E-04	4.60E-03	2.80E-03	2.27E-03	-4.35E+00
GWP-GHG (IPCC AR5)	kg CO ₂ -eq.	9.39E+00	6.71E-04	4.60E-03	2.75E-03	2.25E-03	-4.28E+00
PM	Disease incidences	7.04E-07	4.42E-11	1.18E-10	2.60E-10	2.00E-10	-3.96E-07
IRP	kBq U235 eq.	9.53E-02	1.85E-07	1.27E-06	4.06E-05	3.61E-05	-2.35E-02
ETP-fw	CTUe	3.48E+01	3.94E-03	2.71E-02	3.81E-02	2.26E-02	-1.84E+01
HTP-c	CTUh	3.34E-09	6.47E-14	4.46E-13	8.26E-13	4.03E-13	-1.86E-09
HTP-nc	CTUh	6.33E-08	1.43E-12	9.77E-12	2.90E-11	1.56E-11	-3.93E-08
SQP	Dimension-less	1.43E+01	1.80E-05	1.24E-04	2.11E-02	8.15E-03	-9.73E-01

Table 20: Biogenic Carbon Content

Indicator	Unit	A1-A3
BCC-prod	kg C	0.00E+00
BCC-pack	kg C	1.11E-02

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂

Since Module C is included in the EPD, the use of Module A1-A3 results without considering the results of Module C is discouraged.

Table 21: EN15804+A1 Environmental Impact Indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP (EN15804+A1)	kg CO ₂ -eq.	9.39E+00	6.69E-04	4.55E-03	2.70E-03	2.22E-03	-4.32E+00
ODP (EN15804+A1)	kg CFC11-eq.	1.04E-11	7.87E-17	5.42E-16	9.96E-15	7.14E-15	-6.22E-12
AP (EN15804+A1)	kg SO ₂ -eq.	4.41E-02	2.42E-06	8.26E-06	9.22E-06	1.27E-05	-2.58E-02
EP (EN15804+A1)	kg P eq.	3.05E-03	5.70E-07	1.75E-06	2.16E-06	1.44E-06	-9.76E-04
POCP (EN15804+A1)	kg C ₂ H ₄ -eq.	2.70E-03	2.52E-07	-1.13E-06	1.23E-06	1.05E-06	-1.34E-03
ADPE (EN15804+A1)	kg Sb-eq.	7.04E-07	8.80E-12	6.06E-11	3.01E-09	1.47E-10	-3.91E-07
ADPF (EN15804+A1)	MJ	1.08E+02	8.76E-03	6.03E-02	4.75E-02	2.84E-02	-3.84E+01

Variability of Results

Across the four products considered in this EPD, the variation for the GWP-GHG indicator results for Modules A1-A3 was 10.7% which is driven by the type of surface finishing. The variation across the sites for Modules A1-A3 is <10% for the GWP-GHG indicator.

The variations across other core indicators for Modules A-C are shown in Table 16.

Since Module C is included in the EPD, the use of Module A1-A3 results without considering the results of Module C is discouraged.

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