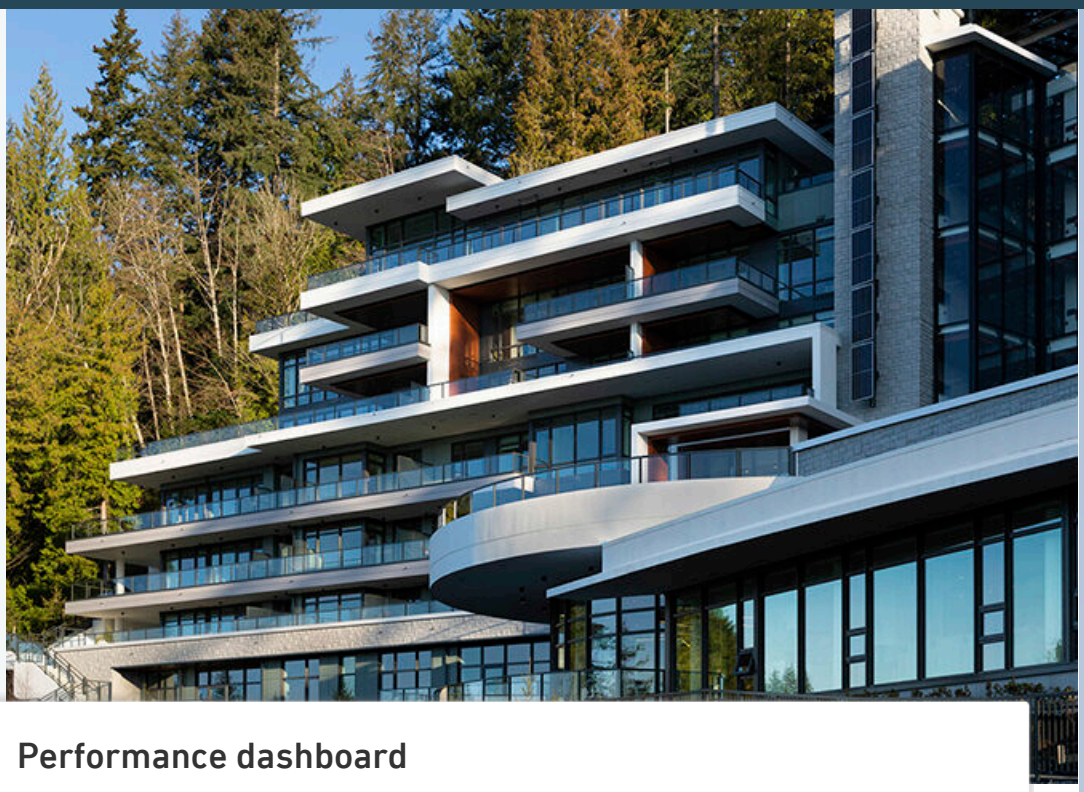
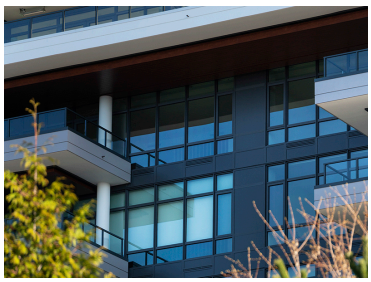
CASCADIA WINDOWS & DOORS

Cascadia Universal Series™ Window Wall

The world's first fiberglass window wall, the Universal Series™ Window Wall is based upon the standard Universal Series™ window system, then augmented with additional components to provide a full-facade high-rise glazing system.

Designed and manufactured in North America, the patented Universal Series™ Window Wall allows developers and architects to dramatically improve the overall thermal performance of buildings, without sacrificing glazing area.





Performance dashboard

Features & functionality

Boasts 100%-250% improved thermal performance compared to traditional aluminum windows, lowering heating and cooling costs

Made from high resin-to-glass, thermoset fiberglass, the windows will not sag, weaken or creep over time

Can withstand extreme temperatures (-40°F through 350°F, and higher) without becoming brittle or soft

Made from non-organic, chemically inert pultruded fiberglass, the windows are not susceptible to corrosion, rot, insect damage or UV degradation

Modelled lifespan of up to 80 years

Visit Cascadia Windows for more product information:

Cascadia Universal Series™ Window Wall

MasterFormat® 08 54 13
Cascadia Universal Series™ Window Wall Guide Spec
Cascadia Universal Series™ Window Wall Technical Data Sheet
Cascadia Universal Series™ Window Wall Warranty Information

For spec help, contact us or call 604-857-4600

Environment & materials

Improved by:

Available with double & triple-glazed Low-E insulated glass units (IGUs)

European-engineered, multi-point locking hardware

Low-VOC standard & custom colors exceed AAMA 625 performance criteria (Hydro Tuff water-borne urethane coatings)

Certifications, rating systems & disclosures:

Energy-Star rated

See LCA, interpretation & rating systems

ENERGY STAR

SM Transparency Report (EPD)™

EPD	LCA
3rd-party reviewed	✓
Transparency Report (EPD)	
3rd-party verified	✓

Validity: 09/05/24 – 09/04/29
CAS – 090524 – 002

This environmental product declaration (EPD) was externally verified by Ecoform, LLC, in accordance with ISO 14025:2006. ISO 21930:2017 serves as the core PCR. NSF sub-category PCR: Fenestration Assembly Product Category Rules.

In accordance with ISO 14044 and the referenced PCR, the life cycle assessment was conducted by Sustainable Minds and critically reviewed by Ecoform, LLC.

Ecoform, LLC
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Knoxville, TN 37932
(865) 850-1883
www.ecoform.com

SUMMARY

Reference PCR
PCR for Fenestration Assemblies, NSF International, 2023

Regions; system boundaries
North America; cradle-to-gate

Declared unit
One square meter (1 m^2) of fenestration assemblies (including frame and glass)

LCIA methodology; LCA software; LCI databases
TRACI 2.1; SimaPro Analyst 9.5; ecoinvent v3.10, and US-EI 2.2

Public LCA
Cascadia LCA report of Universal Series™ Fixed & Operable Windows and Doors, and Universal Series™ Window Wall

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Contact us

LCA results & interpretation

Cascadia Universal Series™ Window Wall

Window Wall Vision Glass | Window Wall Spandrel Glass | Window Wall Bypass | EPD additional content

Scope and summary

● **Cradle to gate** ○ Cradle to gate with options ○ Cradle to grave

Application

The Cascadia Universal Series™ Window Wall Vision Glass offers a patented, high-performance alternative to traditional aluminum window wall systems, designed and manufactured in North America. Window wall vision glass is a large, floor-to-ceiling glazing system designed to maximize natural light and provide unobstructed views. It consists of a structural frame that supports large panels of vision glass, which are clear and transparent, allowing for an open, airy feel in the interior space. The system includes framing, vision glass panels, and necessary hardware for installation and secure attachment. The Universal Series™ Window Wall allows developers and architects to dramatically improve the overall thermal performance of buildings, without sacrificing glazing area. The primary function of these fenestration systems is to create a façade between the building's interior and exterior, limiting thermal transfer through the building envelope.

Declared unit

The declared unit is one 2,000mm × 2,000mm (79in × 79in) window wall normalized to one square meter (1 m^2) of fenestration assemblies (including frame and glass). Glazing beads and stops, sealants, gaskets, and other parts that retain or support the glazing are considered part of the framing assembly, not the glazing assembly. The declared product meets the relevant performance standards in ANSI/NFRC 100 per the identified sub-type.

Mass per declared unit:

Fenestration sub-type	Whole unit, kg	Frame, kg	Glazing, kg
Window Wall Vision Glass	41.5	15	26.5

Manufacturing data

Reporting period: May 2022 – April 2023
Location: British Columbia, Canada

What's causing the greatest impacts

All life cycle stages

Activities during the acquisition and preprocessing of raw materials are responsible for much of the impacts in each impact category. Due to on-site activities such as fabricating the frame and disposing of manufacturing waste, the manufacturing stage is the second highest contributor to global warming and fossil fuel depletion. For all other impact categories, the second highest contributor to the results stems from upstream transportation.

Raw materials acquisition

Raw materials acquisition (A1) dominated the results for all impact categories. This module includes the raw materials acquired and preprocessed by the suppliers, including packaging. This stage makes up 80-90% of the total impacts for all impact categories. The glazing and frame are the two contributors calculated separately in the raw material acquisition stage. The fiberglass window frame generated 42.8% of total GWP results, whereas the glazing generated 52.7% of total GWP results. The glazing unit contains two 6mm glass panes, which are manufactured by an upstream supplier and sourced in North America. The frame unit contains fiberglass and aluminimum lineals, insulation, hardware, and packaging. During the production of these fiberglass lineals, glass fibers and catalyzed polyester resin are combined in a pultrusion process. The fiberglass and aluminum lineals make up the majority of the weight of the frame unit, and they dominate the environmental impacts over the other frame components.

Transportation

Transportation (A2) of raw materials has the second highest contribution to many impact categories at around 5-10%, except for a contribution of 21% to ecotoxicity. This module includes the raw material transportation from suppliers to the Cascadia manufacturing facility. Most of the ingredients sourced in North America are transported by semi-truck, whereas materials sourced from overseas use a mix of road transportation by semi-truck and sea transportation by ship.

Manufacturing

Manufacturing (A3) of raw materials accounts for a notable contribution to Global Warming Potentials (GWP) at around 7% and Fossil Fuel Depletion at around 13%, with relatively low contributions to the remaining impact categories. This module includes fabrication and the disposal of manufacturing waste. The fabrication process includes cutting the fiberglass, drilling, packaging, and cleaning. Fiberglass production waste, incoming raw material packaging waste, and other non-hazardous wastes are transported to a landfill, and recyclable packaging wastes are transported to a recycling facility or reused within the plant.

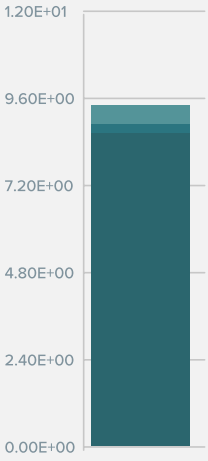
Sensitivity analysis

Sensitivity analyses were performed to check the robustness of the results where the highest potential environmental impacts are occurring. As the bulk of impacts are attributed to raw materials acquisition, a sensitivity analysis was conducted to examine the sensitivity of the different available glazing configurations.

Material composition by wt%

MATERIAL	WT%
Glazing	63.9%
Fiberglass lineals	16.1%
Aluminum lineals	15.7%
Shear block	0.680%
Sill angle	0.490%
Insulation	0.480%
Paint	0.400%
Gaskets	0.160%
Screws	0.050%
Sealant	0.040%
Packaging (wood crate)	1.95%

Total impacts by life cycle stage [mPts/decl unit]



LIFE CYCLE STAGE	MPTS/DECL. UNIT
Raw material acquisition	8.74E+00
Transportation	4.24E-01
Manufacturing	3.08E-01

Total impacts = 9.47E+00 mPts

Global warming potential was evaluated for sensitivity since Cascadia is interested in the potential CO_2-equivalent emissions of its products. The fixed window was evaluated as a worst case scenario, since it has the highest percentage of glazing and therefore provides the most conservative estimate of change. Choosing a triple-glazed product configuration rather than the double-glazed option resulted in a 5% increase in total life cycle impacts.

How we're making it greener

Fiberglass is an ideal structural material for window and door frames, which is why Cascadia has used a proprietary, high glass-fiber-to-resin formula for more than a decade. Beyond its high strength and thermal efficiency, Cascadia's pultruded, thermoset fiberglass frames contain roughly 58% recycled content, low VOC's, and represent less embodied energy compared to vinyl or aluminum.

Not susceptible to decay or corrosion, fiberglass also expands and contracts with temperature change at roughly the same rate as the adjacent IGU. This extends the longevity of window seals and gaskets, reducing maintenance costs. Combined with a modeled lifespan of up to 80 years, fiberglass represents the future of high-performance windows and doors.

See how we make it greener

LCA results

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 UPSTREAM TRANSPORT	A3 MANUFACTURING
	(X) A1 Raw material supply	(X) A2 Transport	(X) A3 Manufacturing
Information modules: **Included (X)** | Excluded (MND)* *Modules A4, A5, B, C, and D are excluded.			

SM Single Score

Impacts per declared unit	8.74E+00 mPts	4.24E-01 mPts	3.08E-01 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage	Upstream manufacturing of the fiberglass lineals and glass panes.	Transportation of raw materials to the Cascadia facility.	Product fabrication including cutting, drilling, packaging, and cleaning.

TRACI v2.1 results per declared unit of Universal Series™ Window Wall Vision Glass (total)

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 TRANSPORT	A3 MANUFACTURING
− Ecological damage			
Impact category / Unit			
Acidification / **kg SO_2 eq**	6.92E-01	9.35E-03	5.37E-03

Impact category	Unit			
Eutrophication	kg N eq	5.93E-02	6.53E-04	4.12E-04
Global warming	kg CO_2 eq	1.12E+02	7.22E+00	9.12E+00
Ozone depletion	kg CFC-11 eq	5.52E-06	1.12E-07	8.29E-08

Human health damage

Impact category	Unit			
Carcinogenics	CTU_h	2.11E-06	4.60E-09	1.86E-09
Non-carcinogenics	CTU_h	1.03E-05	9.08E-07	1.25E-07
Respiratory effects	kg $PM_{2.5}$ eq	7.90E-02	2.28E-03	6.61E-04
Smog	kg O_3 eq	8.04E+00	1.47E-01	1.25E-01

Additional environmental information

Impact category	Unit			
Fossil fuel depletion	MJ surplus	1.32E+02	1.38E+01	2.19E+01
Ecotoxicity	CTU_e	6.76E+01	1.85E+01	2.11E-01

TRACI v2.1 results per declared unit of Universal Series™ Window Wall Vision Glass (frame only)

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 TRANSPORT	A3 MANUFACTURING

Ecological damage

Impact category	Unit			
Acidification	kg SO_2 eq	2.43E-01	6.72E-03	1.94E-03
Eutrophication	kg N eq	2.35E-02	4.61E-04	1.49E-04
Global warming	kg CO_2 eq	4.68E+01	5.01E+00	3.29E+00
Ozone depletion	kg CFC-11 eq	7.62E-07	7.76E-08	2.99E-08

Human health damage

Impact category	Unit			
Carcinogenics	CTU_h	6.31E-07	3.19E-09	6.73E-10
Non-carcinogenics	CTU_h	3.98E-06	6.28E-07	4.50E-08
Respiratory effects	kg $PM_{2.5}$ eq	4.07E-02	1.59E-03	2.39E-04
Smog	kg O_3 eq	2.89E+00	1.06E-01	4.51E-02

Additional environmental information

Impact category	Unit			
Fossil fuel depletion	MJ surplus	4.31E+01	9.56E+00	7.93E+00
Ecotoxicity	CTU_e	4.04E+01	1.28E+01	7.61E-02

TRACI v2.1 results per declared unit of Universal Series™ Window Wall Vision Glass (glazing only)

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 TRANSPORT	A3 MANUFACTURING

Ecological damage

Impact category	Unit			
Acidification	kg SO_2 eq	4.49E-01	2.63E-03	3.43E-03
Eutrophication	kg N eq	3.58E-02	1.92E-04	2.63E-04
Global warming	kg CO_2 eq	6.56E+01	2.22E+00	5.82E+00
Ozone depletion	kg CFC-11 eq	4.76E-06	3.44E-08	5.29E-08

Human health damage

Impact category	Unit			
Carcinogenics	**CTU_h**	1.47E-06	1.41E-09	1.19E-09
Non-carcinogenics	**CTU_h**	6.35E-06	2.80E-07	7.96E-08
Respiratory effects	**kg $PM_{2.5}$ eq**	3.83E-02	6.90E-04	4.22E-04
Smog	**kg O_3 eq**	5.15E+00	4.05E-02	7.97E-02

Additional environmental information

Impact category	Unit			
Fossil fuel depletion	**MJ surplus**	8.89E+01	4.23E+00	1.40E+01
Ecotoxicity	**CTU_e**	2.72E+01	5.72E+00	1.35E-01

References

LCA Background Report
Cascadia Universal Series™ Fixed & Operable Windows and Doors, and Universal Series™ Windows Wall LCA Background Report, Cascadia 2024; SimaPro Analyst 9.5; ecoinvent v3.10 and US-EI 2.2 databases; TRACI 2.1.

ISO 14025, "Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services"

ISO 21930:2017, "Sustainability in Building Construction — Environmental Declaration of Building Products" serves as the core PCR.

NSF PCR for Fenestration Assemblies, version 2
December, 2023. PCR review conducted by Dr. Thomas P. Gloria, Ph.D (Industrial Ecology Consultants) t.gloria@industrial-ecology.com; Jack Geibig (Ecoform) jgeibig@ecoform.com; Bill Stough (Bill Stough, LLC) bill@billstough.net.

Program operator: Sustainable Minds, SM Transparency Report™ / EPD Framework Governance and Program Rules, version 3.2

Download PDF SM Transparency Report / EPD

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. They are designed to present information transparently to make the limitations of comparability more understandable. Environmental declarations of products that conform to the same PCR and include the same life cycle stages, but are made by different manufacturers, may not sufficiently align to support direct comparisons. They therefore cannot be used as comparative assertions unless the conditions as defined in ISO 14025 Section 6.7.2. 'Requirements for Comparability' are satisfied. In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers or programs, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the construction works level per ISO 21930:2017 guidelines, use the same sub-category PCR where applicable, include all relevant information modules, be limited to EPDs applying a functional unit, and be based on equivalent scenarios with respect to the context of construction works. The results of this EPD reflect an average performance by the product, and its actual impacts may vary on a case-to-case basis. Some LCA impact categories and inventory items are still under development and can have high levels of uncertainty. To promote uniform guidance on the data collection, calculation, and reporting of results, the ACLCA methodology (ACLCA 2019) was used.

Rating systems

The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance.

LEED BD+C: New Construction | v4 - LEED v4
Building product disclosure and optimization

Environmental product declarations

- ○ Industry-wide (generic) EPD — ½ product
- ✓ Product-specific Type III EPD — 1 product

LEED BD+C: New Construction | v4.1 - LEED v4.1
Building product disclosure and optimization

Environmental product declarations

- ○ Industry-wide (generic) EPD — 1 product
- ✓ Product-specific Type III EPD — 1.5 products

Collaborative for High Performance Schools National Criteria
MW C5.1 – Environmental Product Declarations

- ✓ Third-party certified type III EPD — 2 points

Green Globes for New Construction and Sustainable Interiors
Materials and resources

- ✓ NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell
- ✓ NC 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs

BREEAM New Construction 2018
Mat 02 - Environmental impacts from construction products

Environmental Product Declarations (EPD)

- ○ Industry-average EPD — .5 points
- ○ Multi-product specific EPD — .75 points
- ✓ Product-specific EPD — 1 point

LCA results & interpretation

Cascadia Universal Series™ Window Wall

Window Wall Vision Glass | Window Wall Spandrel Glass | Window Wall Bypass | EPD additional content

Scope and summary

● **Cradle to gate** ○ Cradle to gate with options ○ Cradle to grave

Application

The Cascadia Universal Series™ Window Wall façade system offers a patented, high-performance alternative to traditional aluminum window wall systems, allowing developers and architects to dramatically improve the overall thermal performance of buildings, without sacrificing glazing area. Designed and manufactured in North America, the Universal Series™ Window Wall façade system's spandrel is an opaque section of a the glazing assembly, and is available in a variety of materials. The spandrel portion of the Window Wall system includes framing, spandrel panel, and necessary hardware for installation and secure attachment. The primary function of Window Wall fenestration systems is to create a façade between the building's interior and exterior, limiting thermal transfer through the building envelope.

Declared unit

The declared unit is one 2,000mm × 2,000mm (79in × 79in) window wall normalized to one square meter (1 m^2) of fenestration assemblies (including frame and glass). Glazing beads and stops, sealants, gaskets, and other parts that retain or support the glazing are considered part of the framing assembly, not the glazing assembly. The declared product meets the relevant performance standards in ANSI/NFRC 100 per the identified sub-type.

Mass per declared unit:

Fenestration sub-type	Whole unit, kg	Frame, kg	Glazing, kg
Window Wall Spandrel Glass	36	22.7	13.3

Manufacturing data

Reporting period: May 2022 – April 2023
Location: British Columbia, Canada

What's causing the greatest impacts

All life cycle stages

Activities during the acquisition and preprocessing of raw materials are responsible for much of the impacts in each impact category. Due to on-site activities such as fabricating the frame and disposing of manufacturing waste, the manufacturing stage is the second highest contributor to global warming and fossil fuel depletion. For all other impact categories, the second highest contributor to the results stems from upstream transportation.

Raw materials acquisition

Raw materials acquisition (A1) dominated the results for all impact categories. This module includes the raw materials acquired and preprocessed by the suppliers, including packaging. This stage makes up 80-90% of the total impacts for all impact categories. The glazing and frame are the two contributors calculated separately in the raw material acquisition stage. The fiberglass window frame generated 66.9% of total GWP results, whereas the glazing generated 33.1% of total GWP results. The glazing unit contains two 6mm glass panes, which are manufactured by an upstream supplier and sourced in North America. The frame unit contains fiberglass and aluminum lineals, insulation, hardware, and packaging. During the production of these fiberglass lineals, glass fibers and catalyzed polyester resin are combined in a pultrusion process. The fiberglass and aluminum lineals make up the majority of the weight of the frame unit, and they dominate the environmental impacts over the other frame components.

Transportation

Transportation (A2) of raw materials has the second highest contribution to many impact categories at around 5-10%, except for a contribution of 20% to ecotoxicity. This module includes the raw material transportation from suppliers to the Cascadia manufacturing facility. Most of the ingredients sourced in North America are transported by semi-truck, whereas materials sourced from overseas use a mix of road transportation by semi-truck and sea transportation by ship.

Manufacturing

Manufacturing (A3) of raw materials accounts for a notable contribution to Global Warming Potentials (GWP) at around 8% and Fossil Fuel Depletion at around 16%, with relatively low contributions to the remaining impact categories. This module includes fabrication and the disposal of manufacturing waste. The fabrication process includes cutting the fiberglass, drilling, packaging, and cleaning. Fiberglass production waste, incoming raw material packaging waste, and other non-hazardous wastes are transported to a landfill, and recyclable packaging wastes are transported to a recycling facility or reused within the plant.

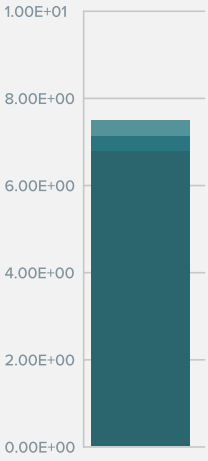
Sensitivity analysis

Sensitivity analyses were performed to check the robustness of the results where the highest potential environmental impacts are occurring. As the bulk of impacts are attributed to raw materials acquisition, a sensitivity analysis was conducted to examine the sensitivity of the different available glazing configurations.

Material composition by wt%

MATERIAL	WT%
Glazing	36.9%
Aluminum lineals	23.7%
Fiberglass lineals	18.7%
Insulation	16.1%
Shear block	0.790%
Gaskets	0.580%
Sill angle	0.560%
Sealant	0.260%
Paint	0.190%
Screws	0.060%
Packaging (wood crate)	2.26%

Total impacts by life cycle stage [mPts/decl unit]



LIFE CYCLE STAGE	MPTS/DECL. UNIT
Raw material acquisition	6.92E+00
Transportation	3.68E-01
Transportation	3.06E-01

Total impacts = 7.59E+00 mPts

Global warming potential was evaluated for sensitivity since Cascadia is interested in the potential CO_2-equivalent emissions of its products. The fixed window was evaluated as a worst case scenario, since it has the highest percentage of glazing and therefore provides the most conservative estimate of change. Choosing a triple-glazed product configuration rather than the double-glazed option resulted in a 5% increase in total life cycle impacts.

How we're making it greener

Fiberglass is an ideal structural material for window and door frames, which is why Cascadia has used a proprietary, high glass-fiber-to-resin formula for more than a decade. Beyond its high strength and thermal efficiency, Cascadia's pultruded, thermoset fiberglass frames contain roughly 58% recycled content, low VOC's, and represent less embodied energy compared to vinyl or aluminum.

Not susceptible to decay or corrosion, fiberglass also expands and contracts with temperature change at roughly the same rate as the adjacent IGU. This extends the longevity of window seals and gaskets, reducing maintenance costs. Combined with a modeled lifespan of up to 80 years, fiberglass represents the future of high-performance windows and doors.

See how we make it greener

LCA results

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 UPSTREAM TRANSPORT	A3 MANUFACTURING
	(X) A1 Raw material supply	(X) A2 Transport	(X) A3 Manufacturing
Information modules: **Included (X)** | Excluded (MND)* *Modules A4, A5, B, C, and D are excluded.			

SM Single Score

Impacts per declared unit	6.92E+00 mPts	3.68E-01 mPts	3.06E-01 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage	Upstream manufacturing of the fiberglass lineals and glass panes.	Transportation of raw materials to the Cascadia facility.	Product fabrication including cutting, drilling, packaging, and cleaning.

TRACI v2.1 results per declared unit of Universal Series™ Window Wall Spandrel Glass (total)

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 TRANSPORT	A3 MANUFACTURING
− Ecological damage			
Impact category / Unit			
Acidification — **kg SO_2 eq**	5.75E-01	8.56E-03	5.33E-03

Impact category	Unit			
Eutrophication	kg N eq	4.90E-02	5.81E-04	3.92E-04
Global warming	kg CO_2 eq	9.72E+01	6.26E+00	9.04E+00
Ozone depletion	kg CFC-11 eq	3.70E-06	9.71E-08	8.23E-08

Human health damage

Impact category	Unit			
Carcinogenics	CTU_h	1.51E-06	3.99E-09	1.85E-09
Non-carcinogenics	CTU_h	8.20E-06	7.86E-07	1.24E-07
Respiratory effects	kg $PM_{2.5}$ eq	8.71E-02	2.00E-03	6.56E-04
Smog	kg O_3 eq	6.50E+00	1.35E-01	1.24E-01

Additional environmental information

Impact category	Unit			
Fossil fuel depletion	MJ surplus	1.02E+02	1.20E+01	2.18E+01
Ecotoxicity	CTU_e	6.30E+01	1.60E+01	2.09E-01

TRACI v2.1 results per declared unit of Universal Series™ Window Wall Spandre Glass (frame only)

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 TRANSPORT	A3 MANUFACTURING

Ecological damage

Impact category	Unit			
Acidification	kg SO_2 eq	3.50E-01	7.24E-03	3.37E-03
Eutrophication	kg N eq	3.11E-02	4.85E-04	2.47E-04
Global warming	kg CO_2 eq	6.44E+01	5.16E+00	5.71E+00
Ozone depletion	kg CFC-11 eq	1.32E-06	8.00E-08	5.19E-08

Human health damage

Impact category	Unit			
Carcinogenics	CTU_h	7.73E-07	3.28E-09	1.17E-09
Non-carcinogenics	CTU_h	5.02E-06	6.46E-07	7.81E-08
Respiratory effects	kg $PM_{2.5}$ eq	6.80E-02	1.66E-03	4.14E-04
Smog	kg O_3 eq	3.93E+00	1.15E-01	7.82E-02

Additional environmental information

Impact category	Unit			
Fossil fuel depletion	MJ surplus	5.71E+01	9.84E+00	1.38E+01
Ecotoxicity	CTU_e	4.94E+01	1.32E+01	1.32E-01

TRACI v2.1 results per declared unit of Universal Series™ Window Wall Spandrel Glass (glazing only)

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 TRANSPORT	A3 MANUFACTURING

Ecological damage

Impact category	Unit			
Acidification	kg SO_2 eq	2.25E-01	1.32E-03	1.97E-03
Eutrophication	kg N eq	1.79E-02	9.62E-05	1.45E-04
Global warming	kg CO_2 eq	3.28E+01	1.11E+00	3.34E+00
Ozone depletion	kg CFC-11 eq	2.38E-06	1.72E-08	3.03E-08

Human health damage

Impact category	Unit			
Carcinogenics	**CTU_h**	7.37E-07	7.06E-10	6.81E-10
Non-carcinogenics	**CTU_h**	3.17E-06	1.40E-07	4.56E-08
Respiratory effects	**kg $PM_{2.5}$ eq**	1.92E-02	3.45E-04	2.42E-04
Smog	**kg O_3 eq**	2.57E+00	2.02E-02	4.57E-02

Additional environmental information

Impact category	Unit			
Fossil fuel depletion	**MJ surplus**	4.45E+01	2.12E+00	8.04E+00
Ecotoxicity	**CTU_e**	1.36E+01	2.86E+00	7.71E-02

References

LCA Background Report
Cascadia Universal Series™ Fixed & Operable Windows and Doors, and Universal Series™ Windows Wall LCA Background Report, Cascadia 2024; SimaPro Analyst 9.5; ecoinvent v3.10 and US-EI 2.2 databases; TRACI 2.1.

ISO 14025, "Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services"

ISO 21930:2017, "Sustainability in Building Construction — Environmental Declaration of Building Products" serves as the core PCR.

NSF PCR for Fenestration Assemblies, version 2
December, 2023. PCR review conducted by Dr. Thomas P. Gloria, Ph.D (Industrial Ecology Consultants) t.gloria@industrial-ecology.com; Jack Geibig (Ecoform) jgeibig@ecoform.com; Bill Stough (Bill Stough, LLC) bill@billstough.net.

Program operator: Sustainable Minds, SM Transparency Report™ / EPD Framework Governance and Program Rules, version 3.2

Download PDF SM Transparency Report / EPD

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. They are designed to present information transparently to make the limitations of comparability more understandable. Environmental declarations of products that conform to the same PCR and include the same life cycle stages, but are made by different manufacturers, may not sufficiently align to support direct comparisons. They therefore cannot be used as comparative assertions unless the conditions as defined in ISO 14025 Section 6.7.2. 'Requirements for Comparability' are satisfied. In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers or programs, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the construction works level per ISO 21930:2017 guidelines, use the same sub-category PCR where applicable, include all relevant information modules, be limited to EPDs applying a functional unit, and be based on equivalent scenarios with respect to the context of construction works. The results of this EPD reflect an average performance by the product, and its actual impacts may vary on a case-to-case basis. Some LCA impact categories and inventory items are still under development and can have high levels of uncertainty. To promote uniform guidance on the data collection, calculation, and reporting of results, the ACLCA methodology (ACLCA 2019) was used.

Rating systems

The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance.

LEED BD+C: New Construction | v4 - LEED v4
Building product disclosure and optimization

Environmental product declarations

○ Industry-wide (generic) EPD	½ product
✓ Product-specific Type III EPD	1 product

LEED BD+C: New Construction | v4.1 - LEED v4.1
Building product disclosure and optimization

Environmental product declarations

○ Industry-wide (generic) EPD	1 product
✓ Product-specific Type III EPD	1.5 products

Collaborative for High Performance Schools National Criteria
MW C5.1 – Environmental Product Declarations

✓ Third-party certified type III EPD	2 points

Green Globes for New Construction and Sustainable Interiors
Materials and resources

✓ NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell
✓ NC 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs

BREEAM New Construction 2018
Mat 02 - Environmental impacts from construction products

Environmental Product Declarations (EPD)

○ Industry-average EPD	.5 points
○ Multi-product specific EPD	.75 points
✓ Product-specific EPD	1 point

LCA results & interpretation

Cascadia Universal Series™ Window Wall

Window Wall Vision Glass | Window Wall Spandrel Glass | Window Wall Bypass | EPD additional content

Scope and summary

● **Cradle to gate** ○ Cradle to gate with options ○ Cradle to grave

Application

The Cascadia Universal Series™ Window Wall façade system offers a patented, high-performance alternative to traditional aluminum window wall systems, allowing developers and architects to dramatically improve the overall thermal performance of buildings, without sacrificing glazing area. Designed and manufactured in North America, the Universal Series™ Window Wall façade system's bypass is a non-structural component of the glazing assembly and is located between the floor slab and the window head. The bypass portion of the Window Wall system includes framing, bypass panel, and necessary hardware for installation and secure attachment. The primary function of Window Wall fenestration systems is to create a façade between the building's interior and exterior, limiting thermal transfer through the building envelope.

Declared unit

The declared unit is one 2,000mm × 2,000mm (79in × 79in) window wall normalized to one square meter (1 m^2) of fenestration assemblies (including frame and glass). Glazing beads and stops, sealants, gaskets, and other parts that retain or support the glazing are considered part of the framing assembly, not the glazing assembly. The declared product meets the relevant performance standards in ANSI/NFRC 100 per the identified sub-type.

Mass per declared unit:

Fenestration sub-type	Whole unit, kg	Frame, kg	Glazing, kg
Window Wall Bypass	19.1	6.1	13

Manufacturing data

Reporting period: May 2022 – April 2023
Location: British Columbia, Canada

What's causing the greatest impacts

All life cycle stages

Activities during the acquisition and preprocessing of raw materials are responsible for much of the impacts in each impact category. Due to on-site activities such as fabricating the frame and disposing of manufacturing waste, the manufacturing stage is the second highest contributor to global warming and fossil fuel depletion. For all other impact categories, the second highest contributor to the results stems from upstream transportation.

Raw materials acquisition

Raw materials acquisition (A1) dominated the results for all impact categories. This module includes the raw materials acquired and preprocessed by the suppliers, including packaging. This stage makes up 90-95% of the total impacts for all impact categories. The glazing and frame are the two contributors calculated separately in the raw material acquisition stage. The fiberglass window frame generated 48.1% of total GWP results, whereas the glazing generated 58.9% of total GWP results. The glazing unit contains two 6mm glass panes, which are manufactured by an upstream supplier and sourced in North America. The frame unit contains fiberglass and aluminum lineals, insulation, hardware, and packaging. During the production of these fiberglass lineals, glass fibers and catalyzed polyester resin are combined in a pultrusion process. The fiberglass and aluminum lineals make up the majority of the weight of the frame unit, and they dominate the environmental impacts over the other frame components.

Transportation

Transportation (A2) of raw materials accounts for the smallest contribution to all impact categories. This module includes the raw material transportation from suppliers to the Cascadia manufacturing facility. Most of the ingredients sourced in North America are transported by semi-truck, whereas materials sourced from overseas use a mix of road transportation by semi-truck and sea transportation by ship.

Manufacturing

Manufacturing (A3) is is the next highest impact contributor of all impact categories except for non-carcinogenics and ecotoxicity, with 6% contribution to global warming potentials and 14% to fossil fuel depletion. This module includes fabrication and the disposal of manufacturing waste. The fabrication process includes cutting the fiberglass, drilling, packaging, and cleaning. Fiberglass production waste, incoming raw material packaging waste, and other non-hazardous wastes are transported to a landfill, and recyclable packaging wastes are transported to a recycling facility or reused within the plant.

Sensitivity analysis

Sensitivity analyses were performed to check the robustness of the results where the highest potential environmental impacts are occurring. As the bulk of impacts are attributed to raw materials acquisition, a sensitivity analysis was conducted to examine the sensitivity of the different available glazing configurations.

Global warming potential was evaluated for sensitivity since Cascadia is interested in the potential CO_2-equivalent emissions of its products. The fixed

Material composition by wt%

MATERIAL	WT%
Glazing	68.0%
Aluminum lineals	29.7%
Paint	0.160%
Screws	0.040%
Packaging (wood crate)	2.12%

Total impacts by life cycle stage [mPts/decl unit]

LIFE CYCLE STAGE	MPTS/DECL. UNIT
Raw material acquisition	4.92E+00
Transportation	8.73E-02
Manufacturing	1.53E-01

Total impacts = 5.16E+00 mPts

window was evaluated as a worst case scenario, since it has the highest percentage of glazing and therefore provides the most conservative estimate of change. Choosing a triple-glazed product configuration rather than the double-glazed option resulted in a 5% increase in total life cycle impacts.

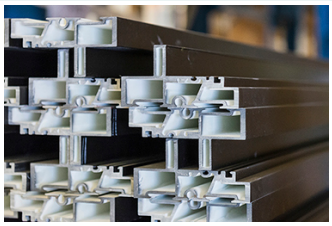
How we're making it greener

Fiberglass is an ideal structural material for window and door frames, which is why Cascadia has used a proprietary, high glass-fiber-to-resin formula for more than a decade. Beyond its high strength and thermal efficiency, Cascadia's pultruded, thermoset fiberglass frames contain roughly 58% recycled content, low VOC's, and represent less embodied energy compared to vinyl or aluminum.

Not susceptible to decay or corrosion, fiberglass also expands and contracts with temperature change at roughly the same rate as the adjacent IGU. This extends the longevity of window seals and gaskets, reducing maintenance costs. Combined with a modeled lifespan of up to 80 years, fiberglass represents the future of high-performance windows and doors.

See how we make it greener

LCA results

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 UPSTREAM TRANSPORT	A3 MANUFACTURING
	(X) A1 Raw material supply	**(X) A2 Transport**	**(X) A3 Manufacturing**
Information modules: **Included (X)** | Excluded (MND)* *Modules A4, A5, B, C, and D are excluded.			

SM Single Score

Impacts per declared unit	4.92E+00 mPts	8.73E-02 mPts	1.53E-01 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage	Upstream manufacturing of the fiberglass lineals and glass panes.	Transportation of raw materials to the Cascadia facility.	Product fabrication including cutting, drilling, packaging, and cleaning.

TRACI v2.1 results per declared unit of Universal Series™ Window Wall Bypass (total)

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 TRANSPORT	A3 MANUFACTURING
− Ecological damage			
Impact category / Unit			
Acidification — **kg SO_2 eq**	4.04E-01	1.77E-03	2.66E-03
Eutrophication — **kg N eq**	3.02E-02	1.29E-04	1.86E-04
Global warming — **kg CO_2 eq**	6.52E+01	1.49E+00	4.51E+00
Ozone depletion — **kg CFC-11 eq**	2.72E-06	2.31E-08	4.11E-08
− Human health damage			

Impact category	Unit			
Carcinogenics	CTU_h	1.19E-06	9.48E-10	9.22E-10
Non-carcinogenics	CTU_h	5.91E-06	1.88E-07	6.18E-08
Respiratory effects	kg $PM_{2.5}$ eq	5.02E-02	4.63E-04	3.28E-04
Smog	kg O_3 eq	4.67E+00	2.72E-02	6.19E-02

Additional environmental information

Impact category	Unit			
Fossil fuel depletion	MJ surplus	6.57E+01	2.84E+00	1.09E+01
Ecotoxicity	CTU_e	3.66E+01	3.84E+00	1.04E-01

TRACI v2.1 results per declared unit of Universal Series™ Window Wall Bypass (frame only)

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 TRANSPORT	A3 MANUFACTURING

Ecological damage

Impact category	Unit			
Acidification	kg SO_2 eq	1.80E-01	4.76E-04	8.52E-04
Eutrophication	kg N eq	1.23E-02	3.48E-05	5.94E-05
Global warming	kg CO_2 eq	3.24E+01	4.01E-01	1.44E+00
Ozone depletion	kg CFC-11 eq	3.39E-07	6.21E-09	1.31E-08

Human health damage

Impact category	Unit			
Carcinogenics	CTU_h	4.53E-07	2.55E-10	2.95E-10
Non-carcinogenics	CTU_h	2.73E-06	5.06E-08	1.98E-08
Respiratory effects	kg $PM_{2.5}$ eq	3.11E-02	1.25E-04	1.05E-04
Smog	kg O_3 eq	2.09E+00	7.32E-03	1.98E-02

Additional environmental information

Impact category	Unit			
Fossil fuel depletion	MJ surplus	2.13E+01	7.65E-01	3.49E+00
Ecotoxicity	CTU_e	2.30E+01	1.03E+00	3.34E-02

TRACI v2.1 results per declared unit of Universal Series™ Window Wall Bypass (glazing only)

LIFE CYCLE STAGE	A1 RAW MATERIAL SUPPLY	A2 TRANSPORT	A3 MANUFACTURING

Ecological damage

Impact category	Unit			
Acidification	kg SO_2 eq	2.25E-01	1.29E-03	1.81E-03
Eutrophication	kg N eq	1.79E-02	9.45E-05	1.26E-04
Global warming	kg CO_2 eq	3.28E+01	1.09E+00	3.07E+00
Ozone depletion	kg CFC-11 eq	2.38E-06	1.69E-08	2.79E-08

Human health damage

Impact category	Unit			
Carcinogenics	CTU_h	7.37E-07	6.93E-10	6.27E-10
Non-carcinogenics	CTU_h	3.17E-06	1.37E-07	4.20E-08
Respiratory effects	kg $PM_{2.5}$ eq	1.92E-02	3.39E-04	2.23E-04
Smog	kg O_3 eq	2.57E+00	1.99E-02	4.21E-02

Additional environmental information

Impact category	Unit			
Fossil fuel depletion	**MJ surplus**	4.45E+01	2.08E+00	7.41E+00
Ecotoxicity	**CTU_e**	1.36E+01	2.81E+00	7.10E-02

References

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Program operator: Sustainable Minds, SM Transparency Report™ / EPD Framework Governance and Program Rules, version 3.2

Download PDF SM Transparency Report / EPD

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LEED BD+C: New Construction | v4 - LEED v4
Building product disclosure and optimization

Environmental product declarations

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✓ Product-specific Type III EPD	1 product

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Building product disclosure and optimization

Environmental product declarations

○ Industry-wide (generic) EPD	1 product
✓ Product-specific Type III EPD	1.5 products

Collaborative for High Performance Schools National Criteria
MW C5.1 – Environmental Product Declarations

✓ Third-party certified type III EPD	2 points

Green Globes for New Construction and Sustainable Interiors
Materials and resources

✓ NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell	
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BREEAM New Construction 2018
Mat 02 - Environmental impacts from construction products

Environmental Product Declarations (EPD)

○ Industry-average EPD	.5 points
○ Multi-product specific EPD	.75 points
✓ Product-specific EPD	1 point

EPD additional content

Cascadia Universal Series™ Window Wall

Window Wall Vision Glass | Window Wall Spandrel Glass | Window Wall Bypass | EPD additional content

Data

Background This product-specific declaration was created by collecting production data from the British Columbia, Canada location. Secondary data sources include those available in ecoinvent v3.10 and US-EI 2.2 databases.

Allocation The PCR prescribes where and how allocation occurs. Since only facility-level data were available, allocation among the facility's other products was necessary to determine the input and output flows associated with the product. To accurately allocate electricity and natural gas used at the facility to window, door, and window wall production, the total annual energy consumption was calculated through labor unit allocation, which proportionally assesses the percentage of manufacturing activities for each product type versus total annual labor activities. Additionally, no co-products were produced during the fabrication processes.

Cut-off criteria for the inclusion of mass and energy flows are 1% of renewable primary resource (energy) usage, 1% nonrenewable primary resource (energy) usage, 1% of the total mass input of that unit process, and 1% of environmental impacts. The total of neglected input flows per module does not exceed 5% of energy usage, mass, and environmental impacts. The only exceptions to these criteria are substances with hazardous and toxic properties, which must be listed even when the given process unit is under the cut-off criterion of 1% of the total mass.

No known flows are deliberately excluded from this declaration, and no substances considered to be hazardous or toxic according to the TRI or local regulations are present in the products. Therefore, these criteria have been met. Biogenic carbon is included in reported results.

Quality of inventory data is judged by its precision (measured, calculated, or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied on a study serving as a data source), and representativeness (geographical, temporal, and technological).

To ensure reliable results, first-hand industry data in combination with consistent background LCA information from SimaPro and LCI databases were used. Primary data associated with the manufacturing process was collected and checked for mass balance and data inventory completeness. Background data were sourced primarily from the ecoinvent database, and other databases were used if data were not available in ecoinvent or the data set was judged to be more representative. Other methodological choices were made consistently throughout the model. The data set is considered complete based on a review between the LCA team and key Cascadia stakeholders. Where country-specific data were unavailable, global or rest-of-world averages were used to represent transportation in those locations. Additionally, no proxy data were used to represent materials and therefore did not have a significant impact of the results.

The following data sets were used in the LCA for modeling glazing:

- Flat glass, uncoated, at plant/US- US-EI U
- Flat glass, coated, at plant/US- US-EI U
- Aluminum, production mix, at plant/US- US-EI U

Scenarios and additional technical information

Installation [A5] Biogenic carbon emissions generated in the installation phase stem from wood crates used as packaging. While the impacts from installation are out of the scope of this cradle-to-gate study, ISO 21930:2017 requires that biogenic carbon emissions associated with packaging disposed after product installation be separately reported. The table below shows that the biogenic carbon removals from packaging in the manufacturing stage (A3) are then accounted for as biogenic carbon emissions from packaging in the installation stage (A5).

Product	Biogenic carbon emissions associated with installation [A5] (kg CO_2)
Universal Series™ Window Wall Vision Glass	7.88E-02
Universal Series™ Window Wall Spandrel Glass	7.88E-02
Universal Series™ Window Wall Bypass	7.88E-02

Flow diagram

- Sheet rolling, aluminium/US- US-EI U
- Argon, liquid, at plant/US- US-EI U
- Zeolite, powder, at plant/RER S
- Polybutadiene, at plant/US- US-EI U
- Polysulphide, sealing compound, at plant/US- US-EI

Major system boundary exclusions:

- Construction of major capital equipment & maintenance and operation of support equipment
- Human labor and employee transport
- Manufacture, transport, and disposal of packaging materials not associated with the final product
- Building operational energy and water use

Major assumptions and limitations:

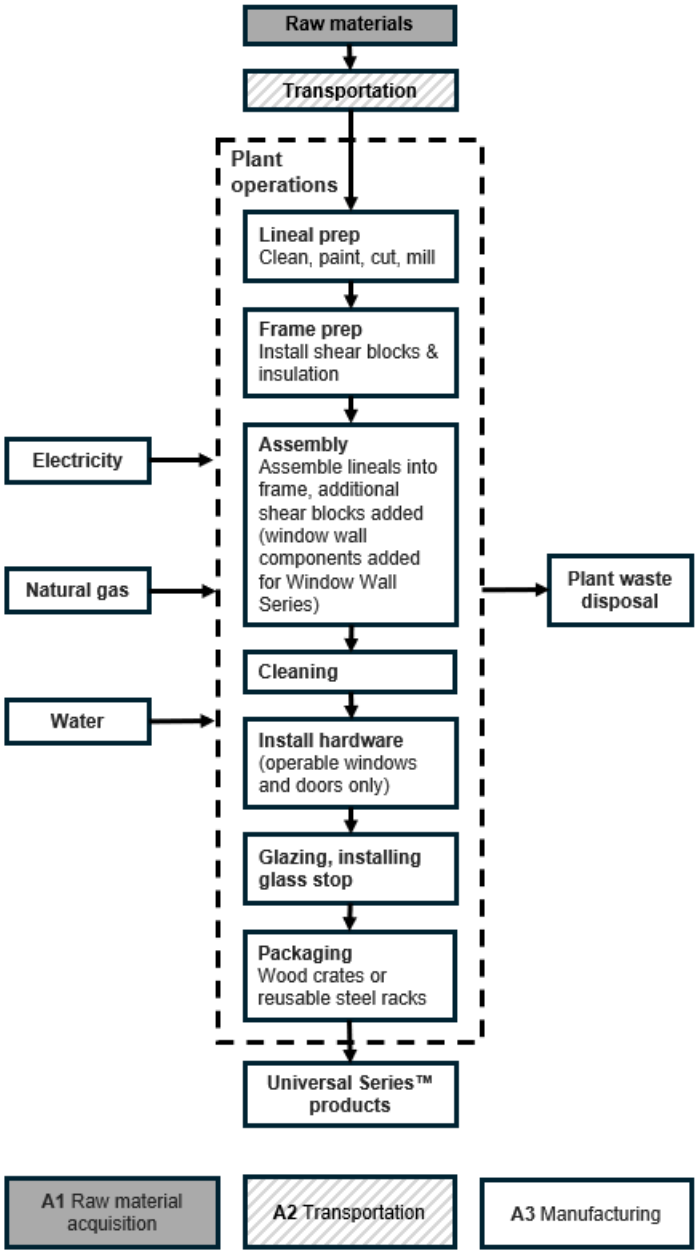
- Primary data were modeled based on the information provided by Cascadia and supplemented by the technical and safety data sheets provided.
- Since energy inputs were not available on a per-product basis, electricity and natural gas consumption were allocated based on the percentage of labor units per product.
- Generic data sets used are considered good quality, but actual impacts from material suppliers, transport carriers, and waste processing may vary.

Calculate addition of operable windows or doors into window wall configuration

To calculate the results of 1m^2 of Window Wall Vision Glass in a window wall configuration that includes operable windows (Casement Window, Awning Window, Tilt & Turn Window, and Hopper Window), use the following equation:
Window Wall Vision Glass results +
[Tilt & Turn frame-only results - Fixed Window frame-only results]

To calculate the results of a window wall configuration which includes single or double swing doors, use the following equation:
Window Wall Vision Glass results +
[Single Swing Door frame-only results - Fixed Window frame-only results]

To calculate the results of a window wall configuration which includes sliding doors, use the following equation:
Window Wall Vision Glass results +
[Sliding Door frame-only results - Fixed Window frame-only results]



Scaling factors: double-glazed to triple-glazed

Results in this EPD are presented assuming a default double-glazed option; however, Window Wall Vision Glass is also available in a triple-glazed configuration. In order to calculate results for triple-glazed Vision Glass, multiply the results in each impact category by their associated product-specific scaling factor shown here:

Impact category	Scaling factor for Window Wall Vision Glass
Ozone depletion	1.42
Global warming	1.25
Smog	1.31
Acidification	1.32
Eutrophication	1.30
Carcinogenics	1.35
Non carcinogenics	1.28
Respiratory effects	1.23
Ecotoxicity	1.16
Fossil fuel depletion	1.26

Universal Series™ Window Wall Vision Glass system: LCIA results, resource use, output and waste flows, and carbon emissions & removals per declared unit

Parameter	Unit	A1	A2	A3	Total
Resource use indicators					
Renewable primary energy used as energy carrier (fuel)	MJ, NCV	1.04E+02	1.59E-01	8.51E+01	**1.89E+02**
Renewable primary resources with energy content used as material	MJ, NCV	1.30E+01	0.00E+00	0.00E+00	**1.30E+01**
Total use of renewable primary resources with energy content	MJ, NCV	1.17E+02	1.59E-01	8.51E+01	**2.02E+02**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, NCV	1.39E+03	1.04E+02	1.63E+02	**1.65E+03**
Non-renewable primary resources with energy content used as material	MJ, NCV	7.66E+01	0.00E+00	0.00E+00	**7.66E+01**
Total use of non-renewable primary resources with energy content	MJ, NCV	1.46E+03	1.04E+02	1.63E+02	**1.73E+03**
Secondary materials	kg	3.92E+00	0.00E+00	8.12E-01	**4.73E+00**
Renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	5.40E-01	**5.40E-01**
Non-renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Recovered energy	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Use of net fresh water resources	m3	2.23E+01	2.07E-01	7.29E-01	**2.32E+01**
Abiotic depletion (fossil fuels)	MJ, LHV	1.23E+03	9.75E+01	1.47E+02	**1.47E+03**
Output flows and waste category indicators					
Hazardous waste disposed	kg	5.97E+00	2.20E-02	8.21E-04	**6.00E+00**
Non-hazardous waste disposed	kg	5.97E+00	8.91E-02	1.22E-02	**6.07E+00**
High-level radioactive waste, conditioned, to final repository	kg	7.38E-05	1.16E-06	6.91E-06	**8.19E-05**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	9.34E-04	2.26E-06	3.57E-06	**9.40E-04**
Components for re-use	kg	0.00E+00	0.00E+00	8.12E-01	**8.12E-01**
Materials for recycling	kg	0.00E+00	0.00E+00	4.30E-02	**4.30E-02**
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Carbon emissions and removals					
Biogenic Carbon Removal from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Biogenic Carbon Emission from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Biogenic Carbon Removal from Packaging	kg CO_2	7.88E-02	0.00E+00	5.39E-01	**6.18E-01**
Biogenic Carbon Emission from Packaging	kg CO_2	0.00E+00	0.00E+00	7.88E-02	**7.88E-02**
Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Calcination Carbon Emissions	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Carbonation Carbon Removals	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

High and low-level radioactive waste reported by A1-A3 modules for Window Wall Vision Glass (frame only) per declared unit

Parameter	Unit	A1	A2	A3	Total
High-level radioactive waste, conditioned, to final repository	kg	7.38E-05	8.07E-07	2.50E-06	**7.71E-05**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	2.36E-04	1.58E-06	1.30E-06	**2.39E-04**

High and low-level radioactive waste reported by A1-A3 modules for Window Wall Vision Glass (glazing only) per declared unit

Parameter	Unit	A1	A2	A3	Total
High-level radioactive waste, conditioned, to final repository	kg	0.00E+00	3.57E-07	4.41E-06	**4.77E-06**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	7.00E-04	6.94E-07	2.28E-06	**7.03E-04**

Universal Series™ Window Wall Spandrel Glass system: LCIA results, resource use, output and waste flows, and carbon emissions & removals per declared unit

Parameter	Unit	A1	A2	A3	Total
Resource use indicators					
Renewable primary energy used as energy carrier (fuel)	MJ, NCV	9.80E+01	1.38E-01	8.46E+01	**1.83E+02**
Renewable primary resources with energy content used as material	MJ, NCV	1.30E+01	0.00E+00	0.00E+00	**1.30E+01**
Total use of renewable primary resources with energy content	MJ, NCV	1.11E+02	1.38E-01	8.46E+01	**1.96E+02**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, NCV	9.61E+02	9.00E+01	1.62E+02	**1.21E+03**
Non-renewable primary resources with energy content used as material	MJ, NCV	2.72E+02	0.00E+00	0.00E+00	**2.72E+02**
Total use of non-renewable primary resources with energy content	MJ, NCV	1.23E+03	9.00E+01	1.62E+02	**1.48E+03**
Secondary materials	kg	3.92E+00	0.00E+00	8.12E-01	**4.74E+00**
Renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	5.40E-01	**5.40E-01**
Non-renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Recovered energy	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Use of net fresh water resources	m3	2.36E+01	1.78E-02	7.23E-01	**2.44E+01**
Abiotic depletion (fossil fuels)	MJ, LHV	1.06E+03	8.45E+01	1.46E+02	**1.29E+03**
Output flows and waste category indicators					
Hazardous waste disposed	kg	7.69E+00	4.05E-04	8.15E-04	**7.69E+00**
Non-hazardous waste disposed	kg	6.68E+00	5.33E-03	1.21E-02	**6.70E+00**
High-level radioactive waste, conditioned, to final repository	kg	9.24E-05	1.01E-06	6.86E-06	**1.00E-04**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	7.02E-04	1.62E-06	2.37E-06	**7.06E-04**
Components for re-use	kg	0.00E+00	0.00E+00	8.12E-01	**8.12E-01**
Materials for recycling	kg	0.00E+00	0.00E+00	4.30E-02	**4.30E-02**
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Carbon emissions and removals					
Biogenic Carbon Removal from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Biogenic Carbon Emission from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Biogenic Carbon Removal from Packaging	kg CO_2	7.88E-02	0.00E+00	5.39E-01	**6.18E-01**
Biogenic Carbon Emission from Packaging	kg CO_2	0.00E+00	0.00E+00	7.88E-02	**7.88E-02**
Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Calcination Carbon Emissions	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Carbonation Carbon Removals	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

High and low-level radioactive waste reported by A1-A3 modules for Window Wall Spandrel Glass (frame only) per declared unit

Parameter	Unit	A1	A2	A3	Total
High-level radioactive waste, conditioned, to final repository	kg	9.24E-05	8.31E-07	4.33E-06	**9.76E-05**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	3.52E-04	1.62E-06	2.24E-06	**3.56E-04**

High and low-level radioactive waste reported by A1-A3 modules for Window Wall Spandrel Glass (glazing only) per declared unit

Parameter	Unit	A1	A2	A3	Total
High-level radioactive waste, conditioned, to final repository	kg	0.00E+00	1.79E-07	2.53E-06	**2.71E-06**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	3.50E-04	0.00E+00	1.33E-07	**3.50E-04**

Universal Series™ Window Wall Bypass system: LCIA results, resource use, output and waste flows, and carbon emissions & removals per declared unit

Parameter	Unit	A1	A2	A3	Total
Resource use indicators					

Renewable primary energy used as energy carrier (fuel)	MJ, NCV	4.88E+01	3.28E-02	4.23E+01	**9.11E+01**
Renewable primary resources with energy content used as material	MJ, NCV	6.09E+00	0.00E+00	0.00E+00	**6.09E+00**
Total use of renewable primary resources with energy content	MJ, NCV	5.48E+01	3.28E-02	4.23E+01	**9.72E+01**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, NCV	7.93E+02	2.14E+01	8.10E+01	**8.95E+02**
Non-renewable primary resources with energy content used as material	MJ, NCV	7.21E-01	0.00E+00	0.00E+00	**7.21E-01**
Total use of non-renewable primary resources with energy content	MJ, NCV	7.93E+02	2.14E+01	8.10E+01	**8.96E+02**
Secondary materials	kg	0.00E+00	0.00E+00	4.06E-01	**4.06E-01**
Renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Non-renewable secondary fuels	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Recovered energy	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Use of net fresh water resources	m3	1.83E+01	5.43E-02	3.92E-01	**1.87E+01**
Abiotic depletion (fossil fuels)	MJ, LHV	6.72E+02	2.01E+01	7.28E+01	**7.65E+02**
Output flows and waste category indicators					
Hazardous waste disposed	kg	5.09E+00	4.54E-03	4.08E-04	**5.10E+00**
Non-hazardous waste disposed	kg	3.48E+00	1.84E-02	6.05E-03	**3.51E+00**
High-level radioactive waste, conditioned, to final repository	kg	5.41E-05	2.40E-07	3.43E-06	**5.77E-05**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	4.79E-04	4.67E-07	1.72E-06	**4.82E-04**
Components for re-use	kg	0.00E+00	0.00E+00	4.06E-01	**4.06E-01**
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Carbon emissions and removals					
Biogenic Carbon Removal from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Biogenic Carbon Emission from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Biogenic Carbon Removal from Packaging	kg CO_2	7.88E-02	0.00E+00	5.39E-01	**6.18E-01**
Biogenic Carbon Emission from Packaging	kg CO_2	0.00E+00	0.00E+00	7.88E-02	**7.88E-02**
Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Calcination Carbon Emissions	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Carbonation Carbon Removals	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**

High and low-level radioactive waste reported by A1-A3 modules for Window Wall Bypass (frame only) per declared unit

Parameter	Unit	A1	A2	A3	Total
High-level radioactive waste, conditioned, to final repository	kg	5.41E-05	6.46E-08	1.10E-06	**5.52E-05**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	1.30E-04	1.26E-07	5.14E-07	**1.30E-04**

High and low-level radioactive waste reported by A1-A3 modules for Window Wall Bypass (glazing only) per declared unit

Parameter	Unit	A1	A2	A3	Total
High-level radioactive waste, conditioned, to final repository	kg	0.00E+00	1.75E-07	2.33E-06	**2.51E-06**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	3.50E-04	3.40E-07	1.20E-06	**3.51E-04**

Significant data limitations currently exist within the LCI data used to generate waste metrics for Life Cycle Assessments and Environmental Product Declarations. The waste metrics were calculated in a way conformant with the requirements of ISO 21930:2017, but these values represent rough estimates and are for informational purposes only. As such, no decisions regarding actual cradle-gate waste performance between products should be derived from these reported values.

How we make it greener

Cascadia Universal Series™ Window Wall

Collapse all

RAW MATERIALS ACQUISITION

Cascadia's windows and doors are designed and manufactured in North America, using resins and fiberglass rovings from domestic and foreign suppliers. These chemically inert materials are combined through pultrusion, creating a thermoset fiberglass that won't creep, sag, or decay over its 80-year modelled service life. Cascadia's pultruded, thermoset fiberglass frames also contain roughly 58% recycled content.

MANUFACTURING

Efficiencies in manufacturing help Cascadia minimize their environmental impacts. Incoming fiberglass pultrusions are painted on an automatic paint line, cutting down on waste that would otherwise be generated using a manual process.

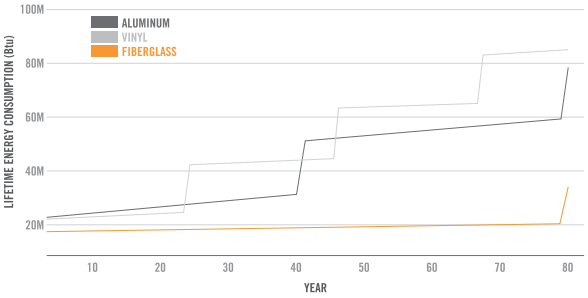
DISTRIBUTION

Cascadia works with project stakeholders to optimize shipping and transportation methods, using a variety of shipping materials depending on project requirements, including reusable steel racks or custom-made reusable wood crates. The steel racks are returned to Cascadia via a return program and reused many times over several years and are used for about two thirds of all shipments, cutting down the need for one-time-use packaging.

USE & END OF LIFE

With a modeled lifespan of up to 80 years, fiberglass windows are expected to consume less energy over their lifetime compared to aluminum and vinyl.

Fiberglass windows and doors are able to resist issues common with other materials like corrosion, rot, insect damage, or UV degradation. While windows and doors of all material types are commonly sent to the landfill, whether due to glazing tape contamination or wear and tear, the durability of fiberglass helps extend the longevity of these products, which means fewer replacements over the life of the building and ultimately fewer trips to the landfill.



Life cycle primary energy consumption of one window frame, including embodied energy, use phase energy loss, and disposal energy requirements. Sudden increases in energy consumption indicate window frame replacement and represent the energy required to dispose of the old frame as well as manufacture a new one.

Broeckx-Smith, S., Suh, S. (2019). Comparative Life Cycle Energy and Greenhouse Gas Emission Performance of Window Frame Materials. Goleta, CA, USA: VitalMetrics (IERS LLC.).

SM Transparency Report (EPD)™

EPD	LCA
3rd-party reviewed	✓
	Transparency Report (EPD)
3rd-party verified	✓

Validity: 09/05/24 – 09/04/29
CAS – 090524 – 002

This environmental product declaration (EPD) was externally verified by Ecoform, LLC, in accordance with ISO 14025:2006. ISO 21930:2017 serves as the core PCR. NSF sub-category PCR: Fenestration Assembly Product Category Rules.

In accordance with ISO 14044 and the referenced PCR, the life cycle assessment was conducted by Sustainable Minds and critically reviewed by Ecoform, LLC.

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SUMMARY

Reference PCR
PCR for Fenestration Assemblies, NSF International, 2023

Regions; system boundaries
North America; cradle-to-gate

Declared unit
One square meter (1 m^2) of fenestration assemblies (including frame and glass)

LCIA methodology; LCA software; LCI databases
TRACI 2.1; SimaPro Analyst 9.5; ecoinvent v3.10, and US-EI 2.2

Public LCA
Cascadia LCA report of Universal Series™ Fixed & Operable Windows and Doors, and Universal Series™ Window Wall

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