Environmental Product Declaration

Fireframes® Curtainwall Series with Pilkington Pyrostop® IGU 120-203

Fireframes® Curtainwall Series Fire-rated Frames

This EPD was created using a UL-verified EPD generator for Allegion's full product portfolio. For additional product specific EPDs, please contact Allegion at Tim.Weller@allegion.com.

ALLEGION™

TGP FIRE RATED

Since 1980, Technical Glass Products (TGP) has been supplying innovative solutions for specialized glazing needs. TGP is the recognized leader in the fire-rated glass and framing field, working closely with design professionals, building code officials and manufacturers to identify glass and framing solutions for the wide-ranging requirements of today's commercial buildings.

As a member of Allegion, TGP recognizes the value of the Leadership in Energy and Environmental Design (LEED) rating system to building environmentally safe and sustainable structures. By using Life Cycle Assessment and Environmental Product Declarations, we aim to provide our customers with the information they need to make decisions regarding their own sustainable building concepts and green solutions.

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UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

TGP FIRE RATED

Fireframes® Curtainwall Series Fire-rated Frame with Pilkington Pyrostop® IGU 120-203

CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

According to ISO 14025, EN 15804, and ISO21930:2017

PROGRAM OPERATOR	UL Environment www.ul.com 333 Pfingsten Rd, Northbrook, IL 60062 www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022
MANUFACTURER NAME AND ADDRESS	Technical Glass Products Frame: 8107 Bracken Pl SE, Snoqualmie, WA 98065 Glass: 7460 Ponderosa Rd, Perrysburg, OH 43551
DECLARATION NUMBER	4789828313.128.1
DECLARED PRODUCT & DECLARED UNIT	1 square meter of installed curtainwall
REFERENCE PCR AND VERSION NUMBER	UL PCR Part A - Version 3.2 IBU PCR Part B Curtain walling v1.6
DESCRIPTION OF PRODUCT'S INTENDED APPLICATION AND USE	Installed to provide fire-rated interior or exterior covering of a building
PRODUCT RSL DESCRIPTION	N/A
MARKETS OF APPLIABILITY	North America
DATE OF ISSUE	March 1, 2023
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-specific
EPD SCOPE	Cradle-to-gate with Options
YEAR OF REPORTED MANUFACTURER PRIMARY DATA	2021
LCA SOFTWARE & VERSION NUMBER	GaBi ts Version 10.6.1.135
LCI DATABASE & VERSION NUMBER	GaBi Content Version 2022.1
LCIA METHODOLOGY & VERSION NUMBER	CML 2001-Jan 2016 and TRACI 2.1
The sub-category PCR review was conducted by:	Institut Bauen and Umwelt e.V. (IBU) PCR Review Panel Info@ibu-epd.com

This declaration was independently verified in accordance with ISO 14025:2006. The UL Environment "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," v3.2 (Dec 2018), based on ISO 21930:2017, serves as the core PR, with additional considerations from CEN Norm EN 15804 (2013) and the USGBC/UL Environment Part A Enhancement (2017) ☐ INTERNAL ☒ EXTERNAL	Cooper McC Cooper McCollum, UL Environment
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine, Thrive ESG

LIMITATIONS

Environmental declarations from different programs (ISO 14025) may not be comparable.

Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under this PCR.

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According to ISO 14025, EN 15804 and ISO 21930:2017

Full conformance with this PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

1. Product Definition and Information

1.1. Description of Company

Allegion Plc is a publicly traded global company that manufactures security door products.

More than 25 global brands included under the Allegion parent company umbrella are sold in 120 different countries. Among these brands are TGP (fire-rated glass and framing), Schlage (locks), Von Duprin (exit devices), Ives (hinges, stops and miscellaneous builders' hardware), Falcon (locks, exit devices and closers), Glynn Johnson (holders/ stops and push/pull latches), and Steelcraft (steel door and frames).

Allegion operates plants across the United States and internationally.

1.2. Product Description

The Fireframes® Curtainwall Series allows for large, multi-story expanses of glass using narrow steel profiles and Pilkington Pyrostop® fire-resistive-rated glass, composed of Pilkington Optiwhite™ glass and clear intumescent interlayers. An alternative to solid walls, the fire-rated curtain wall system provides clear sightlines while blocking the spread of flames and protecting against the transfer of radiant and conductive heat transfer. Suitable for interior and exterior applications. The product is field-erected..

This EPD covers the Fireframes® Curtainwall Series frame system installed with Pilkington Pyrostop® IGU (120-203, 120-106, 120-201, 120-282, 120-382, 120-104, 120-262, or 120-362).

Figure 1: Fireframes® Curtainwall Series Frame

1.3. Application

Fireframes® Curtainwall Series by Technical Glass Products can be used in commercial interior and exterior applications.

1.4. Technical Data

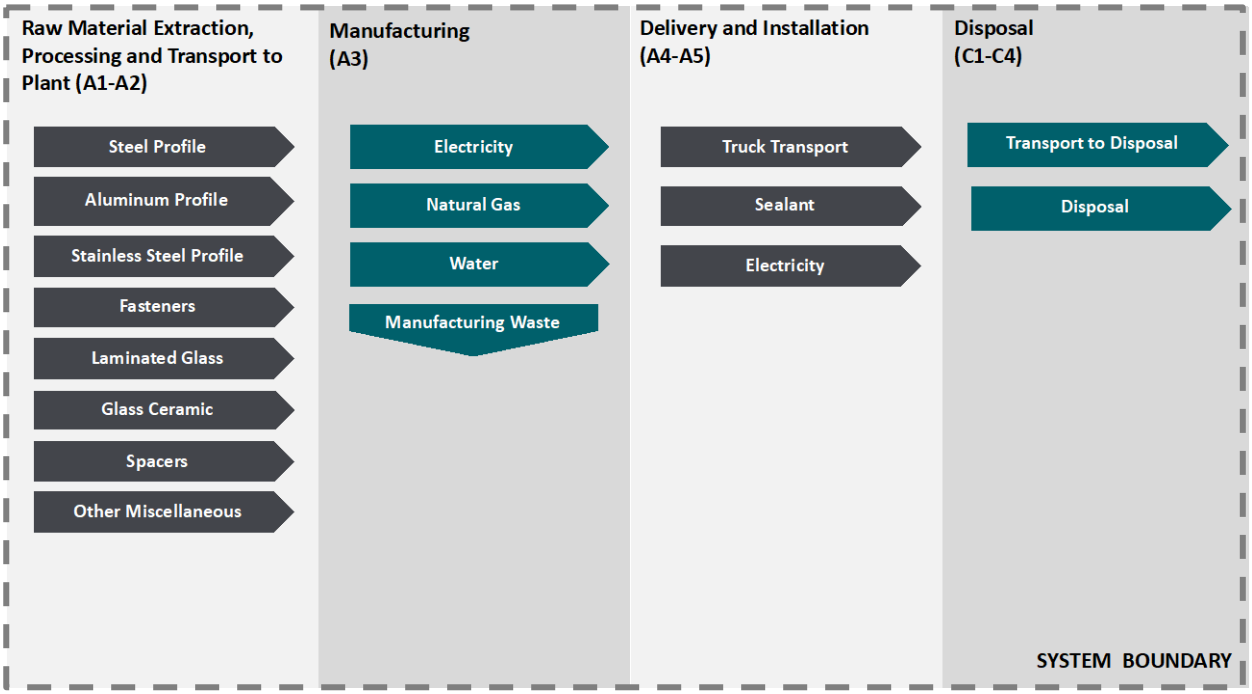
Table 1: Technical Data

TEST*	RESULT	UNIT	STANDARD
Driving Rain Impermeability	No leakage after 1 cycle of 15 minutes at 30 psf. No leakage after 4 cycles of 5 minutes at 30 psf.	-	ASTM E547-00 ASTM E331-00
Air Permeability	0.68 at 1.57 psf; 0.41 at 6.24 psf	ft3/min	ASTM E283-04
Fire Resistances	120 (specific to glass options)	minutes	ANSI/UL 263 CAN/ULC-S101
Uniform Load Deflection at Design Pressure	No damage after positive 40.0 psf. No damage after negative 40.0 psf. Maximum Measured Deflection Positive = 0.291 inches. Maximum Measured Deflection Negative = 0.285 inches. Maximum Measured Permanent Set = 0.014 inches.	-	ASTM E330-02
Direct Airborne Sound Insulation	44 (specific to glass options)	dB	EN ISO 140-3
Total Energy Transmittance G	62 (Pilkington Pyrostop® 120-203 IGU) 69 (Pilkington Pyrostop® 120-202 Monolithic Glass)	%	EN 410
Light Transmission Level Rv	74 (Pilkington Pyrostop® 120-203 IGU) 83 (Pilkington Pyrostop® 120-202 Monolithic Glass)	%	EN 410

*Other properties are not tested for the product systems.

1.5. Declaration of Methodological Framework

This EPD is cradle-to-gate with options, as represented by the flow diagram below. A summary of the life cycle stages can be found in Table 4. The cut-off criteria are described in Cut-off Rules, and the allocation procedures are described in the Allocation section. No known flows are deliberately excluded from this EPD. Third party verified ISO 14040/44 secondary LCI data sets contribute more than 67% of total impacts in all impact categories required by the PCR.



1.6. Material Composition

The materials that make up the declared product system are indicated in Table 2.

Table 2: Material Composition

MATERIAL	FIREFRAMES® CURTAINWALL SERIES WITH PILKINGTON PYROSTOP® 120-203
Aluminum	0.5%
Steel	12.5%
Nylon 6	0.1%
Stainless Steel	1.8%
Powder Coating	0.3%
Silicone Compound	0.5%
EPDM	0.3%
Laminated Glass	84.1%
Calcium Silicate	<0.1%
Wood	<0.1%

1.7. Properties of Declared Product as Delivered

Fireframes® Curtainwall Series by Technical Glass Products is shipped from two manufacturing facilities to the project site and is field-erected.

1.8. Manufacturing

The metal frames of Fireframes® Curtainwall Series product system are manufactured at TGP's Perrysburg, OH facility, and the glass components are manufactured at Snoqualmie, WA facility. Raw materials are mined and processed by the supply chain and partly by TGP. Manufacturing begins at receiving bays where the sub-components are delivered. These components are then cut, finished, and shipped to the site for installation. For some components whose manufacturing process could not be determined, stamping was used as a default due to its versatility to form various types of components.

Energy resources used in the manufacturing process include electricity, natural gas and water. Manufacturing waste is also generated throughout each step as the products are formed and assembled. All waste is either landfilled or recycled.

1.9. Packaging

Components of product systems are separately shipped and the system is field-erected. There is virtually no primary packaging material used and secondary packaging materails are reused.

1.10. Transportation

It is assumed that all raw materials are distributed by truck and ship, based on global region. An average distance using this information was calculated and used in the model.

The transport distance to the end customers was calculated based on sales data for the year 2021. The transportation distance for all waste flows is assumed to be 160.93 km.

1.11. Product Installation

General installation guidance of Fireframes® Curtainwall Series can be found online. Fireframes® Curtainwall Series is field-erected and installed by professional teams. Installation equipment and material handling equipment are required though not included in the study as these are multi-use tools and the impacts per declared unit is considered negligible. Installation waste is generated and disposed of in this stage. Installation waste disposal have been modeled as per guidelines in section 2.8.5 of *Part A: Life Cycle Assessment Calculation Rules and Report Requirements* from UL Environment. Installation waste are either landfilled, incinerated or recycled.

Product should be installed by a professional and is subject to commercial building codes. Proper equipment, including protective equipment, should be used. TGP products must be installed in full compliance with manufacturer's written instructions, which are included with each product.

1.12. Reuse, Recycling, and Energy Recovery

Fireframes® Curtainwall Series may be recycled or resued at the end of life. The LCA that this EPD is created from takes the conservative approach by assuming that all products are disposed of within the system boundary.

1.13. Disposal

Disposal pathways in the EPD are modeled in accordance with disposal routes and waste classification referenced in Sections 2.8.5 and 2.8.6 of *Part A: Life Cycle Assessment Calculation Rules and Report Requirements* from UL Environment. This indicates an end-of-life split amongst landfill, recycling, and incineration pathways. For metals disposed in the United States, 85% is recycled and 15% is landfilled. All glass and plastics are landfilled in the United States.

2. Life Cycle Assessment Background Information

2.1. Declared Unit

The declared unit for curtain wall is 1 square meter of installed fire-rated frame with glass installed in a North American standard commercial building, as indicated in Table 3.

Table 3: Declared Unit Details

Name	Fireframes® Curtainwall Series with Pilkington Pyrostop® 120-203	Unit
Declared Unit	One square meter	

Name	Fireframes® Curtainwall Series with Pilkington Pyrostop® 120-203	Unit
Mass per declared unit, including fasteners	131.66	kg
Reference Service Life (RSL)	N/A	years
The fasteners needed for installation are supplied by the manufacturer with the product and therefore are accounted for together with the product.		

2.2. System Boundary

The type of EPD is cradle-to-gate with options. All LCA modules are included and are summarized in Table 4.

Table 4: Summary of Included Life Cycle Stages

Module Name	Description	Analysis Period	Summary of Included Elements
A1	Product Stage: Raw Material Supply	2021	Raw Material sourcing and processing as defined by secondary data.
A2	Product Stage: Transport	2021	Shipping from supplier to manufacturing site. Fuel use requirements estimated based on product weights and estimated distance.
A3	Product Stage: Manufacturing	2021	Energy, water and material inputs required for manufacturing products from raw materials. Packaging materials and manufacturing waste are included as well.
A4	Construction Process Stage: Transport	2021	Shipping from manufacturing site to project site. Fuel use requirements estimated based on product weights and mapped distances.
A5	Construction Process Stage: Installation	2021	Installation materials, installation waste and packaging material waste.
B1	Use Stage: Use	N/A	The usage of this product does not result in direct material impacts or emissions.
B2	Use Stage: Maintenance	N/A	The maintenance of the products does not involve any consumption of energy or resources.
B3	Use Stage: Repair	N/A	The product does not require repairing once installed.
B4	Use Stage: Replacement	N/A	Total materials and energy required to manufacture the replacements needed to meet the functional unit.
B5	Use Stage: Refurbishment	N/A	The products do not require refurbishment once installed.
B6	Operational Energy Use	N/A	Operational energy consumption for door frame products was not considered as Part B Curtainwalling PCR.
B7	Operational Water Use	N/A	The use of the products does not impact the operational water use of the building.
C1	EOL: Deconstruction	2021	No inputs required for deconstruction.
C2	EOL: Transport	2021	Shipping from project site to landfill. Distance assumed to be 200 km from installation site to landfill.
C3	EOL: Waste Processing	2021	Waste processing not required. All waste can be processed as is.
C4	EOL: Disposal	2021	The disposal process of the product varies with the material type as per Part A Section 2.8.5. The impacts from landfilling and recycling are modeled based on secondary data.
D	Benefits beyond system	N/A	Module not declared

2.3. Estimates and Assumptions

All estimates and assumptions are within the requirements of ISO 14040/44. The majority of the estimations are within the primary data. The primary data was collected as annual totals including all utility usage and production information. For the LCA, the usage information was divided by the production in pieces to create an energy and water use per declared unit, i.e., one unit of product. Other assumptions are listed below:

- It is assumed stamping is the manufacturing process of the upstream metal part when either the appropriate process wasn't available or was unknown.
- Several proxies were chosen from materials within the model due to the lack of appropriate secondary data and have been described in the raw materials section.
- The use and selection of secondary datasets from GaBi – The selection of which generic dataset to use to represent an aspect of a supply chain is a significant value choice. Collaboration between LCA practitioners, TGP associates and GaBi data experts was valuable in determining best-case scenarios in the selection of data. However, no generic data can be a perfect fit. Improved supply chain specific data would improve the accuracy of results, however budgetary and time constraints have to be taken into account.
- The installation tools are used enough times that the per unit of product impacts are negligible.

2.4. Cut-off Criteria

All inputs in which data was available were included. Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the declared unit.

There is no excluded material or energy input or output, except as noted below:

- The packaging materials are excluded.
- As the tools used during the installation of the product are multi-use tools and can be reused after each installation, the per-declared unit impacts are considered negligible and therefore are not included. However, the electricity used to drill holes for installation has been included.
- Some material inputs may have been excluded within the secondary GaBi datasets used for this project. All GaBi datasets have been critically reviewed and conform to the exclusion requirements of the PCR.

2.5. Data Sources

Primary data were collected by facility personnel and from utility bills and was used for all manufacturing processes. Whenever available, supplier data was used for raw materials used in the production process. When primary data did not exist, secondary data for raw material production was utilized from GaBi 10.6.1.135, GaBi Database Version 2022.1.

2.6. Data Quality

Geographical Coverage

The geographical scope of the manufacturing portion of the life cycle is Perrysburg, OH and Snoqualmie, WA. This EPD uses country specific energy datasets that take into account US eGrid specific energy and transportation mixes. Overall

geographic data quality is considered good.

Time Coverage

Primary data were provided by TGP associates and represent calendar year 2021. Using 2021 data meets the PCR requirement that manufacturer specific data be within the last 5 years. Time coverage of this data is considered very good. Data necessary to model unit processes was sourced from Sphera LCI datasets. All the datasets used in the model are within 5 years old except nine used for background modeling (eight within 10 years and one of 13 years). All datasets rely on at least one 1-year average data. Overall time coverage of the datasets is considered good and meets the requirement of the PCR that all data be updated within a 10-year period. The specific time coverage of secondary datasets can be referenced in the dataset references table in each supplemental LCA report.

Technological Coverage

Primary data provided by TGP are specific to the technology that the company uses in manufacturing their product. It is site specific and considered of good quality. It is worth noting that the energy and water used in manufacturing the product includes overhead energy such as lighting, heating and sanitary use of water. Sub-metering was not available to extract process only energy and water use from the total energy use. Sub-metering would improve the technological coverage of data quality. Data necessary to model cradle-to-grave unit processes was sourced from Sphera LCI datasets (GaBi). Technological coverage of the datasets is considered good relative to the actual supply chain of TGP. While improved life cycle data from suppliers would improve technological coverage, the use of lower quality generic datasets does meet the goal of this EPD.

Completeness

The data included is consider complete. The LCA model included all known material and energy flows, with the exception of what is listed in Section 2.4. As pointed out in that section, no known flows above 1% were excluded and the sum of all excluded flows totals less than 5%.

2.7. Period under Review

The period under review is calendar year 2021.

2.8. Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. To derive a per-unit value for manufacturing inputs such as electricity, thermal energy, and water, allocation based on total production in pieces was adopted. Discussions with TGP staff divulged this was a more representative way to allocate the manufacturing inputs based on the manufacturing processes used and the types of products created. There are several other products that are assembled and packaged within the same facility. It is assumed that energy used for these purposes are the same across different products. Regarding secondary datasets, as a default, GaBi datasets use a physical mass basis for allocation.

3. Life Cycle Assessment Scenarios[1]

Table 5: Transport to the building site (A4)

NAME	FIREFRAMES ® CURTAINWALL SERIES WITH PILKINGTON PYROSTOP® 120-203	UNIT
Fuel type	Diesel	-
Liters of fuel	38.43	l/100km
Vehicle type	Truck – Trailer, basic enclosed/ 50,000 lb. payload	-
Transport distance	1.82E+03	km
Capacity utilization	65	%
Weight of products transported	131.66	kg
Volume of products transported	113.56	m^3
Capacity utilization volume factor	1	-

Table 6: Installation into the building (A5)

NAME	FIREFRAMES ® CURTAINWALL SERIES WITH PILKINGTON PYROSTOP® 120-203	UNIT
Auxiliary	The fasteners for installation are accounted for in A1-A3.	
Other resources (silicone sealant)	4.54E-01	kg
Water consumption	0	m3
Electricity	1	kWh
Other energy carriers	0	MJ
Material loss	0	kg
Output substances following waste treatment on site	1.79E-01	kg
Dust in the air	0	kg CO_2
VOC emission	N/A	µg/m^3

Table 7: End of life (C1-C4)

NAME	FIREFRAMES ® CURTAINWALL SERIES WITH PILKINGTON PYROSTOP® 120-203	UNIT
Assumptions for scenario development	The deconstruction of the hardware is assumed to be manual. The deconstructed product is collected with mixed construction waste. As required by the PCR Par A, the waste classification is based on the RCRA for North American region, and the non-metal waste is 100% landfilled, while the metal waste is 85% recycled and 15% landfilled.	

[1] The tables for B1, B2, B3, B5, B6 and B7 are not included as these stages do not involve any flow input or output.

NAME	FIREFRAMES ® CURTAINWALL SERIES WITH PILKINGTON PYROSTOP® 120-203	UNIT
Collected with mixed construction waste	1.32E+02	kg
Non-metal Landfilling – 100%	1.12E+02	kg
Metal Waste Recycling (85%)	1.67E+01	kg
Metal Waste Landfilling (15%)	2.94E+00	kg
Product or material for final deposition	1.15E+02	kg

4. Life Cycle Assessment Results

Table 8: Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
Cradle to Grave	X			X	X	MND							X	X	X	X	MND

4.1. Fireframes® Curtainwall Series Fire-rated Frame with Pilkington Pyrostop® IGU 120-203

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	CML Impacts (Europe, Rest of World)														
GWP [kg CO2 eq]	7.40E+02	3.28E+01	3.54E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.69E+00	0.00E+00	4.89E+00	MND
ODP [kg CFC 11 eq]	1.08E-07	3.52E-12	1.77E-11	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.82E-13	0.00E+00	9.07E-12	MND
AP [kg SO2 eq]	3.63E+00	4.34E-02	8.82E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	3.52E-03	0.00E+00	1.94E-02	MND
EP [kg Phosphate eq]	4.43E-01	1.18E-02	9.35E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	9.43E-04	0.00E+00	2.94E-03	MND
POCP [kg Ethene eq]	2.10E-01	-1.09E-02	1.08E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	-1.21E-03	0.00E+00	1.94E-04	MND
ADP-elements [kg Sb eq]	5.53E-04	1.06E-05	6.16E-05	MND	MND	MND	MND	MND	MND	MND	0.00E+00	5.46E-07	0.00E+00	1.32E-06	MND
ADP-fossil fuel [MJ]	9.74E+03	3.85E+02	4.73E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.99E+01	0.00E+00	5.67E+01	MND
	TRACI Impacts (North America)														
AP [kg SO2 eq]	4.06E+00	5.81E-02	9.48E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	4.79E-03	0.00E+00	2.13E-02	MND
EP [kg N eq]	2.83E-01	7.54E-03	6.18E-04	MND	MND	MND	MND	MND	MND	MND	0.00E+00	5.05E-04	0.00E+00	1.73E-03	MND
GWP [kg CO2 eq]	7.40E+02	3.28E+01	3.54E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.69E+00	0.00E+00	4.89E+00	MND
ODP [kg CFC 11 eq]	1.16E-07	6.21E-14	3.06E-13	MND	MND	MND	MND	MND	MND	MND	0.00E+00	3.21E-15	0.00E+00	1.56E-13	MND
Resources [MJ]	1.16E+03	6.12E+01	5.04E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	3.16E+00	0.00E+00	9.37E+00	MND
POCP [kg O3 eq]	6.19E+01	1.31E+00	1.47E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	1.09E-01	0.00E+00	3.72E-01	MND
	Carbon Emissions and Uptake														
BCRP [kg CO2]	4.44E-02	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
BCEP [kg CO2]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	3.76E-02	0.00E+00	MND
BCRK [kg CO2]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
BCEK [kg CO2]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
BCEW [kg CO2]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
CCE [kg CO2]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
CCR [kg CO2]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
CWNR [kg CO2]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Resource Use Indicators														
RPR_E [MJ]	2.29E+03	1.80E+01	2.68E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	9.30E-01	0.00E+00	6.95E+00	MND
RPR_M [MJ]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RPR_T [MJ]	2.29E+03	1.80E+01	2.68E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	9.30E-01	0.00E+00	6.95E+00	MND
$NRPR_E$ [MJ]	1.09E+04	4.62E+02	5.86E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.39E+01	0.00E+00	7.41E+01	MND
$NRPR_M$ [MJ]	5.56E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
$NRPR_T$ [MJ]	1.09E+04	4.62E+02	5.86E+01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.39E+01	0.00E+00	7.41E+01	MND
SM [kg]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW [m3]	4.01E+00	6.46E-02	3.98E-02	MND	MND	MND	MND	MND	MND	MND	0.00E+00	3.34E-03	0.00E+00	1.06E-02	MND
	Output Flows and Waste Categories														
HWD [kg]	1.93E+00	1.92E-09	6.83E-09	MND	MND	MND	MND	MND	MND	MND	0.00E+00	9.94E-11	0.00E+00	2.78E-09	MND
NHWD [kg]	3.28E+01	3.97E-02	7.90E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	2.05E-03	0.00E+00	1.16E+02	MND
HLRW [kg]	3.82E-04	1.52E-06	2.93E-06	MND	MND	MND	MND	MND	MND	MND	0.00E+00	7.85E-08	0.00E+00	7.41E-07	MND
ILLRW [kg]	2.99E-01	1.28E-03	3.34E-03	MND	MND	MND	MND	MND	MND	MND	0.00E+00	6.62E-05	0.00E+00	6.49E-04	MND
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MR [kg]	5.80E+01	0.00E+00	1.02E-01	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	1.64E+01	0.00E+00	MND
MER [kg]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EEE [MJ]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	7.62E-03	MND
EET [MJ]	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	3.59E-03	MND
EE {MJ}	0.00E+00	0.00E+00	0.00E+00	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	1.12E-02	MND

5. LCA Interpretation

Overall, the vast majority of the product system's impacts are found in A1-A3, mainly derived from the major materials: glass sheets and steel components. Increasing the use of recycled content and reducing the scrap rate are recommended to reduce the environmental impact of the product system.

6. Additional Environmental Information

6.1. Environment and Health During Manufacturing

TGP meets all federal and state standards related to the Environment and Health during manufacturing. Beyond what is regulated, there are no additional environment and health considerations during the production of goods.

6.2. Environment and Health During Installation

The installation instruction that can be found on TGP 's website should be referred to and followed to have proper and safe installation.

6.3. Environment and Health During Use

There are no environmental or health considerations during the use of the product.

6.4. Extraordinary Effects

Fire

Fireframes® Curtainwall Series fire-rated frames meet the broadest fire rating requirements. When combined with Pilkington Pyrostop® at 60 minutes or greater, is classified and listed with UL as a transparent wall, a fire resistive assembly that blocks the transfer of radiant heat during a fire. Lower ratings (45 minute) are considered a window assembly.

Water

Should the product become flooded, the water should be removed by means of extraction and drying and the product should behave as originally intended. There are no environmental impacts associated with the product being flooded.

Mechanical Destruction

If the product is mechanically destroyed, it should be disposed using standard procedures and replaced promptly.

7. Supporting Documentation

The full text of the acronyms found in Section 4 are found in Table 9.

Table 9: Acronym Key

Acronym	Text	Acronym	Text
LCA Indicators			
ADP-elements	Abiotic depletion potential for non-fossil resources	GWP	Global warming potential
ADP-fossil	Abiotic depletion potential for fossil resources	ODP	Depletion of stratospheric ozone layer
AP	Acidification potential of soil and water	POCP	Photochemical ozone creation potential
EP	Eutrophication potential	Resources	Depletion of non-renewable fossil fuels
LCI Indicators			
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PENRT	Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)
PERM	Use of renewable primary energy resources used as raw materials	SM	Use of secondary materials
PERT	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	RSF	Use of renewable secondary fuels
PENRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	NRSF	Use of non-renewable secondary fuels
PENRM	Use of non-renewable primary energy resources used as raw materials	FW	Net use of fresh water
HWD	Disposed-of-hazardous waste	MR	Materials for recycling
NHWD	Disposed-of non-hazardous waste	MER	Materials for energy recovery
ILLRW	Disposed-of intermediate- and low-level radioactive waste	EEE	Exported electrical energy
HLRW	Disposed-of high-level radioactive waste	EET	Exported thermal energy
CRU	Components for reuse	EE	Exported energy

8. References

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3. PCR Guidance-Texts for Building-related Products and Services Part B: Requirements on the EPD for Curtain walling. Institut Bauen und Umwelt e.V. Version 1.6
4. ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
5. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
6. ISO 14044: 2006/ Amd 1:2017 Environmental Management – Life cycle assessment – Requirements and Guidelines – Amendment 1.
7. ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.
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