ENVIRONMENTAL PRODUCT DECLARATION

VIEW SMART GLASS

VIEW INC.
ELECTROCHROMIC GLASS PRODUCTS

View Smart Windows use artificial intelligence to transform buildings into responsive environments that automatically adjust to control heat and glare without the need for blinds.

View is the leader in smart building technology that transforms buildings to improve human health and experience, reduce energy consumption and carbon emissions, and generate additional revenue for building owners. View Smart Windows use artificial intelligence to automatically adjust in response to the sun, eliminating the need for blinds and increasing access to natural light. Every View installation includes a cloud-connected smart building platform that can easily be extended to improve indoor cellular coverage, enhance building security and reimagine the occupant experience. View is installed and designed into 75 million square feet of buildings including offices, hospitals, airports, educational facilities, hotels and multi-family residences.

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

view

According to ISO 14025, and EN 15804

Smart Glass

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Environment 333 Pfingsten Road Northbrook, IL 60611	https://www.ul.com https://spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	UL ProviGeneral Program Instructions v.2.5 March 2020ded	
MANUFACTURER NAME AND ADDRESS	View Inc. 12380 Kirk Rd, Olive Branch, MS 38654	
DECLARATION NUMBER	4790034756.101.1	
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1 m^2	
REFERENCE PCR AND VERSION NUMBER	Product Category Rule (PCR) Guidance for Building-Related Products and Services Part B: Processed Glass EPD Requirements. UL, First Edition, August 17, 2016	
DESCRIPTION OF PRODUCT APPLICATION/USE	Coated Electrochromic Building Glass Product	
PRODUCT RSL DESCRIPTION (IF APPL.)		
MARKETS OF APPLICABILITY	Residential, Multi-Family, Commercial, Healthcare	
DATE OF ISSUE	October 1, 2021	
PERIOD OF VALIDITY	5 Years	
EPD TYPE	Product-Specific	
RANGE OF DATASET VARIABILITY	n/a	
EPD SCOPE	Cradle to gate	
YEAR(S) OF REPORTED PRIMARY DATA	Calendar Year 2020	
LCA SOFTWARE & VERSION NUMBER	SimaPro v9.1.1.1	
LCI DATABASE(S) & VERSION NUMBER	ecoinvent v3.5	
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1 v4; CML v2 Baseline	

The PCR review was conducted by:	UL Provided UL Provided UL Provided
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Thomas P. Gloria, Industrial Ecology Consultants
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sustainable Solutions Corporation
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas P. Gloria, Industrial Ecology Consultants

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a 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.

Product Definition and Information

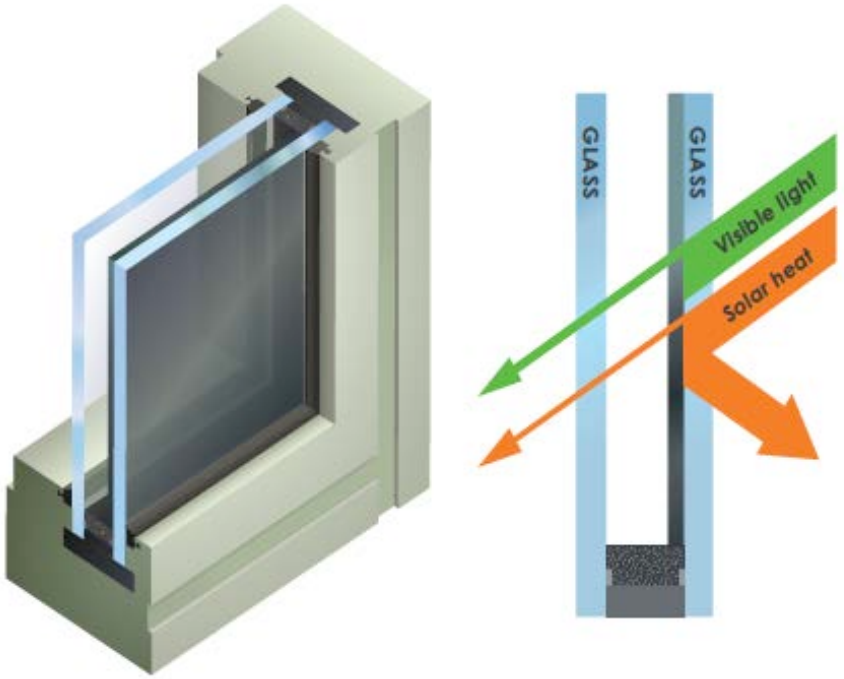
Product Description

Product Identification

The declared product is one square meter of a View Smart Glass insulating glass unit (IGU).

The unit consists of two panes of glass with a 6mm clear outer lite in its standard configuration with the electrochromic coating on surface 2. The electrochromic coating tints when a voltage is applied to the glass. The inner lite is typically 6 mm clear glass but can be selected from a range of colored options, laminates, and low emissivity coatings. The Insulated Glass Unit (IGU) is filled with argon gas for insulation.

Figure 1 – Smart Glass Cross-section



Application

Smart Glass is used across multiple verticals of the real estate industry, including commercial offices, airports, hospitals and healthcare facilities, multi-family residential, and educational buildings.

Declaration of Methodological Framework

ISO 14040: 2006 - Environmental management – Life cycle assessment

ISO 14044: 2006 - Environmental management — Life cycle assessment — Requirements and guidelines

ISO 14025: 2006 - Environmental labels and declarations — Type III environmental declarations — Principles and procedures

ISO 21930: 2006 - Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services

Technical Requirements

The following are the performance parameters of View Smart Glass.

Table 1 - VIEW SMART GLASS STANDARD DUAL PANE CONFIGURATION

	TRANSMITTANCE (%)			REFLECTANCE (%)			THERMAL PROPERTIES		
EC Tint Level	Visible	UV	Solar	Visible Out	Visible In	Solar Out	U-Value (Btu/h*ft^{2}F | W/m^{2}K)	Solar Heat Gain Coefficient	Sound Transmission Class Rating (db)
Tint 1	52	2	31	12	18	12	0.29 | 1.65	0.40	32
Tint 2	31	1	16	8	16	10		0.25	
Tint 3	6	0	3	6	16	9		0.12	
Tint 4	1	0	0	6	16	9		0.09	

Properties of Declared Product as Delivered

The EPD for View Smart Glass was conducted based on a declared unit of 1 m^2. View Smart Glass is manufactured to customers spec and as such is typically produced in non-standard dimensions. As such the ratio of materials in this declaration is based on the average sized IGU of 20 square feet (1.86 m^2).

Material Composition

The material composition of the represented IGU is as follows:

Table 2 - Product Composition

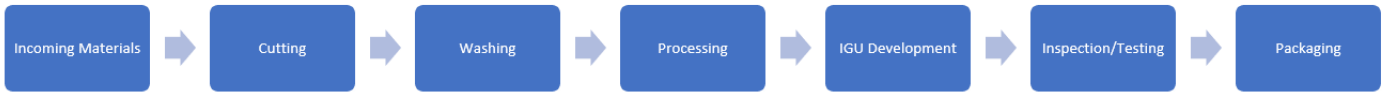
MATERIAL	% COMPOSITION
Float Glass	92.9%
Silicon	5.44%
Spacer	0.99%
Curing Agent	0.26%

MATERIAL	% COMPOSITION
Pigtail Assembly	0.25%
Other Materials(<0.1% each)	0.16%

Manufacturing

View Smart Glass is manufactured in the production facility located in Olive Branch, Mississippi. The process starts with float glass, which is cut to size, washed, polished, and tempered, before being coated with a proprietary blend of metals to achieve its electrochromic properties. The coated glass is then mated with a variety of options – uncoated glass, coated glass and , a spacer, and dual sealants to form an insulating glass unit (IGU), which is wired to provide electrical current to the glass surface. Fabricated IGUs then undergo thorough cycle testing and quality assurance before being packaged for distribution.

Figure 2 - Manufacturing Process Diagram



Packaging

View utilizes two types of packaging – Metal A-frames and wood frames. For larger scale projects, View Smart Glass is often shipped on steel A-frames, which are designed to secure and carry completed IGUs. For this packaging configuration, the A-frames are returned to the Olive Branch, MS facility for reuse. More commonly, View Smart Glass is packaged and shipped in wooden crates, sized to accommodate the specified product.

Transportation

The end product transportation utilizes ground transportation methods, primarily by truck. The raw material transportation takes place mostly by truck and air freight and materials are shipped an average distance of 900km to the production facility.

Product Installation

The IGU is to be installed as per specifications in the GANA Glazing Manual, IGMA Glazing Guidelines, and manufacturer's Glazing Guidelines. Each IGU contains a 15 inch (38.1 cm) cable that is to be connected to the View controls system.

Use

View Smart Glass uses artificial intelligence to adjust the tint in real time in anticipation of and response to environmental factors. The key factors affecting glass tint include the depth of sun shining into the space, the amount of heat passing through the windows, and the cloud cover and reflections from nearby buildings. View Smart Glass may also be manually controlled through a mobile application, allowing the user to control the tint level remotely and create schedules.

Reference Service Life and Estimated Building Service Life

As this PCR does not cover the product use stage (modules B1-B7), consideration or reporting of the product reference service life is not applicable.

Reuse, Recycling, and Energy Recovery

Dynamic Glass is not typically reused or recycled at the end of life.

Disposal

Dynamic Glass is not suitable for energy from waste, and as such, landfill is the typical disposal option.

Life Cycle Assessment Background Information

Functional or Declared Unit

The declared unit for processed glass is one square meter.

Table 3 - Declared Unit

NAME	VALUE	UNIT
Declared Unit	1	m^2
Mass per piece	32.4	kg
Conversion factor to 1 kg	0.031	-
Thickness	24	mm

System Boundary

This EPD is classified as “cradle-to-gate.” The study system boundary includes the transportation of major inputs to (and within) each activity stage including the shipment of final products to the use site, based on logistics data provided and /or assumptions made detailed in the Life Cycle Inventory. Any site-generated energy and purchased electricity is included in the system boundary. The extraction, processing and delivery of purchased primary fuels, e.g., natural gas and primary fuels used to generate purchased electricity, are also included within the boundaries of the system.

Table 4 -System Boundary

Product Stage		
A1	A2	A3
Raw Materials Supply	Transport	Manufacturing
X	**X**	**X**

Estimates and Assumptions

Clean, flat glass scrap generated from the process is assumed to be recycled; other process scrap is assumed to be landfilled.

Cut-off Criteria

Processes whose total contribution to the final result, with respect to their mass and in relation to all considered impact categories, is less than 1% can be neglected. The sum of the neglected processes may not exceed 5% by mass of the considered impact categories. For that a documented assumption is admissible.

For Hazardous Substances the following requirements apply:

- The Life Cycle Inventory (LCI) of hazardous substances will be included, if the inventory is available.
- If the LCI for a hazardous substance is not available, the substance will appear as an input in the LCI of the product, if its mass represents more than 0.1% of the product composition.
- If the LCI of a hazardous substance is approximated by modeling another substance, documentation will be provided.

This EPD is in compliance with the cut-off criteria. No processes were neglected or excluded. Capital items for the production processes (machine, buildings, etc.) were not taken into consideration.

Data Sources

SimaPro v9.1.1 software was utilized for modeling this study. All process data including inputs (raw materials, energy and water) and outputs (emissions, waste water, solid waste, and final products) are evaluated and modeled to represent each process that contributes to the life cycle of the products.

Additionally all secondary sources are taken from literature, previous LCI studies, and life cycle databases. The US LCI database (www.nrel.gov/lci) is frequently used in this analysis. When North American data were not available for a product or process, the European ecoinvent LCI database was utilized.

Data Quality

Data used for this study are as current as possible. Data sets used for calculations are within the last 10 years for generic data and within the last calendar year for manufacturer-specific primary data. All data sets is representative of the US.

Period under Review

Primary data for this study was collected for the reference period from December 2019 – November 2020. Primary data includes formulations, manufacturing energy and water consumption, as well as waste generation. Water treatment chemicals and other ancillary materials are included in the scope of this study.

Allocation

Allocation was conducted per total production by area at the Olive Branch, MS facility.

Comparability Full conformance with the PCR for North American Processed Glass allows EPD comparability only when all stages of the processed glass life cycle have been considered. Comparison of the environmental performance of processed glass 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. Variations and deviations in the results upstream or downstream of the life cycle stages declared are possible due to the use of different Life Cycle Assessment (LCA) software and background Life Cycle Inventory (LCI) datasets.

Life Cycle Assessment Results

Life Cycle Impact Assessment Results

Table 5 - North American Impact Assessment Results

TRACI v2.1		Unit	Float Glass	A1	A2	A3	Total A1-A3
Global Warming Potential	GWP-100	kg CO_2 eq	1.0E+02	1.2E+02	8.8E+00	2.3E+02	3.6E+02
Ozone Depleting Potential	ODP	kg CFC^{-11} eq	1.1E-05	1.6E-05	7.5E-08	4.0E-05	5.6E-05
Acidification Potential	AP	kg SO_2 eq	9.1E-01	1.0E+00	5.2E-02	6.5E-01	1.7E+00
Eutrophication Potential	EP	kg N eq	1.5E-01	2.9E-01	3.0E-03	9.1E-01	1.2E+00
Smog Potential	SP	kg O_3 eq	1.1E+01	1.2E+01	1.4E+00	6.5E+00	2.0E+01
Fossil Fuel Depletion	FFD	MJ	1.5E+02	1.2E+03	1.1E+02	2.6E+03	3.9E+03

Table 6 - EU Impact Assessment Results

CML v4.2		Unit	Float Glass	A1	A2	A3	Total A1-A3
Global Warming Potential	GWP 100	kg CO_2 eq	1.0E+02	1.2E+02	8.9E+00	2.3E+02	3.6E+02
Ozone Depleting Potential	ODP	kg CFC^{-11} eq	8.1E-06	1.4E-05	5.6E-08	3.4E-05	4.8E-05
Acidification Potential	AP	kg SO_2 eq	9.1E-01	1.0E+00	4.3E-02	6.4E-01	1.7E+00
Eutrophication Potential	EP	kg PO_4^{-3} eq	1.1E-01	1.8E-01	7.7E-03	4.1E-01	6.1E-01
Photochemical Ozone Creation Potential	POCP	kg ethene eq	3.1E-02	3.5E-02	2.0E-03	3.6E-02	7.3 E-02
Abiotic Depletion Potential -element	$ADP_{element}$	kg Sb-eq	1.2E-02	2.5E-02	2.0E-07	1.6E-03	2.7E-02
Abiotic Depletion Potential -fossil	ADP_{fossil}	MJ, LHV	1.1E+03	1.2E+03	1.1E+02	2.6E+03	3.9E+03

Life Cycle Inventory Results

Table 7 - Resource Use

Parameter		Unit	Float Glass	A1	A2	A3
Renewable Primary Resources as Energy	RPR_E	MJ	4.9E+01	6.5E+01	1.0E-02	2.9E+02
Renewable Primary Resources as a Feedstock Material	RPR_M	MJ	-	3.7E+01	-	-
Total Renewable Primary Resources	RPR_T	MJ	4.9E+01	1.2E+02	1.0E-02	3.2E+02
Non-Renewable Primary Resources as Energy	$NRPR_E$	MJ	1.2E+03	1.4E+03	1.2E+02	5.9E+03
Non-Renewable Primary Resources as a Feedstock Material	$NRPR_M$	MJ	-	1.5E+00	-	
Total Non-Renewable Primary Resources	$NRPR_T$	MJ	1.2E+03	1.4E+03	1.2E+02	5.9E+03
Secondary Material Use	SM	kg	-	-	-	-
Renewable secondary fuels	RSF	MJ	-	-	-	-
Non-Renewable secondary fuels	NRSF	MJ	-	-	-	-
Renewable Energy	RE	MJ	-	-	-	-
Freshwater Use	FW	m^3	5.6E-01	8.5E-01	1.0E-04	2.1E+00

Table 8 - Output Flows and Waste Categories

Parameter		Unit	Float Glass	A1	A2	A3
Hazardous Waste Disposed	HWD	kg	-	-	-	9.90E-01
Non-Hazardous Waste Disposed	NHWD	kg	-	-	-	1.40E+01
High-Level Radioactive Waste	HLRW	kg/m^3	UNK	UNK.	UNK.	UNK.
Intermediate And Low-Level Radioactive Waste	ILLRW	kg/m^3	UNK	UNK.	UNK.	UNK.
Components For Reuse	CRU	kg	-	-	-	-
Recycling	R	kg	-	-	-	-
Materials For Energy	MER	kg	-	-	-	-
Exported Energy	EE	MJ	-	-	-	-

Table 9 - Carbon Emissions and Removals

Parameter		Unit	Float Glass	A1	A2	A3
Biogenic Carbon Removal from Product	BCRP	kg CO_2	-	-	-	-
Biogenic Carbon Emissions from Product	BCEP	kg CO_2	-	-	-	-
Biogenic Carbon Removal from Packaging	BCRK	kg CO_2	-	1.1E+00	-	-
Biogenic Carbon Emissions from Packaging	BCEK	kg CO_2	-	-	-	-
Biogenic Carbon Emissions from Combustion of Waste	BCEW	kg CO_2	-	-	-	-
Calcination Carbon Emissions	CCE	kg CO_2	4.7E-02	4.7E-02	-	-
Carbonation Carbon Removal	CCR	kg CO_2	-	-	-	-
Carbon Emissions from Combustion of Waste from Non-Renewable Sources	CWNR	kg CO_2	-	-	-	-

LCA Interpretation

The cradle-to-gate life cycle of View Smart Glass is driven by both the raw material extraction and processing stage (A1) and the manufacturing stage (A3), while impacts from raw material sourcing (A2) are minor. Within the raw material extraction and processing stage (A1), the upstream production of flat glass drives the impact. Within the manufacturing stage (A3), electricity consumption is the most impactful input.

Additional Environmental Information

Environment and Health During Manufacturing

View is committed to minimize the environmental impact of our Dynamic Glass production and distribution. Employees are aware of View's environmental roles and responsibilities through training and support from the management team. View has established procedures to monitor waste streams for compliance in existing recycling programs. Additionally, the company includes human rights, labor practices, and work environment in the published code of conduct. The health and safety of employees and contractors is a primary focus point, and View continually strives for zero injuries by providing extensive training and personal protective gear that meets or exceeds industry standards.

Environment and Health During Installation

There is no harmful emissive potential. No damage to health or impairment is expected under normal use of the product.

Extraordinary Effects

Fire

No harmful emissions are anticipated when the product is exposed to fire conditions.

Water

No substances are used which have a nagative impact on water quality on contact by the door with water.

Mechanical Destruction

No danger to the environment can be anticipated during mechanical destruction.

Environmental Activities and Certifications

Certified under the AAMA/WDMA/CSA/101/IS2/A440 North American Fenestration Standard/Specification (NAFS) for windows, doors, and skylights. Declare Lable approved by The International Living Future Institute, ID: View-0001. Health Product Declaration (HPD) published with the HPD Colabrative (HPDC) Online Builder, classification 08810. ISO 14001 certified.

Further Information

For more information, please visit www.view.com or contact View at info@view.com or 1-408-514-6512.

References

- ISO 21930: Sustainability in building construction – Environmental declaration of building products
- EN 15804: Sustainability of construction works, Environmental product declarations, Core rules for the product category of construction products.
- EPA, Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI)
- FTC Part 260, Green guides
- (ILCD, 2010) Joint Research Commission, 2010, ILCD Handbook: General Guide for Life Cycle Assessment
- Intergovernmental Panel on Climate Change (IPCC)
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 14040:2006 Environmental management - Life cycle assessment – Principles and framework
- ISO 14044:2006 Environmental management - Life cycle assessment – Requirements and guidelines
- Product Category Rules for Building Related Products and Services; Part A: Calculation Rules for the Life Cycle
- Assessment and Requirements on the Project Report; UL Environment and Institut Bauen und Umwelt e.V. Version 1.3
- PCR Guidance for Building-Related Products and Services; Part B: Processed Glass EPD Requirements; UL Environment and Institut Bauen und Umwelt e.V. Version 1.0; Published 8/17/2016
- IGMA North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial And Residential Use TM 2000-90(04)
- ASTM E1300 Standard Practice for Determining Load Resistance of Glass in Buildings
- ASTM C1036 Standard Specification for Flat Glass
- ASTM C1048 Standard Specification for Heat-Treated Flat Glass
- ASTM E2141 Standard Test Methods for Assessing the Durability of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units
- ASTM E2953 Standard Specification for Evaluating Accelerated Aging Performance of Electrochromic Devices in Sealed Insulating Glass Units.
- ASTM C1376 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass
- ASTM C1172 Standard Specification for Laminated Architectural Flat Glass
- ASTM E2188 Standard Test Method for Insulating Glass Unit Performance
- ASTM E2189 Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units
- ASTM E2190 Standard Specification for Insulating Glass Unit Performance and Evaluation
- IGMA TB-1201-89(05) Sealant Manufacturers Minimum Sealant Dimensions and Placement Survey
- IGMA TM-4000-02(07) Insulating Glass Manufacturing Quality Procedures Technical Manual
- American National Institute (ANSI) Z97.1-2009 Standard - Safety Glazing Materials Used in Buildings
- Consumer Product Safety Commission (CPSC) 16 CFR 1201 - Safety Standard for Architectural Glazing Materials