



Sensitile Systems®



Declaration Owner:

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Products

Sensitile Systems Acrylic Resin Panels with Glass
Product Lines: Jali®; Scintilla®, Lumina™, SLANT®

Declared Unit

The declared unit is 1 m² of panel surface. Reference flow for the EPD is 1 m² of a 1" thickness, with a total weight of 47 kg/m²

EPD Number and Period of Validity

SCS-EPD-04815
EPD Valid January 9, 2018 through January 8, 2023
Version: May 23, 2019

Product Category Rule

Product Category Rule (PCR) for preparing an Environmental Product Declaration (EPD) for Construction Products and CPC 54 Construction Services, v2.2, May 2017.

Addendum for Adapting the International EPD® System PCR for use in North America Construction Products and Construction Services Product Group Classification: Multiple UN CPC Codes, SCS Global Services, Sept. 27, 2017
CEN standard EN 15804 served as the core PCR

Program Operator

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Disclaimers: This EPD conforms to ISO 21930, ISO 14025, ISO 14040, ISO 14044, and EN 15804.

Scope of Results Reported: The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.

Accuracy of Results: Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.

Comparability: The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

PCR review, was conducted by	The Technical Committee of the International EPD® System. Chair: Massimo Marino info@enviorndec.com
Approved: January 9, 2018 through January 8, 2023	
Independent verification of the declaration and data, according to ISO 14025:2006 and ISO 21930:2007.	<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Third party verifier	 signature to come

PRODUCT DESCRIPTION

Sensitile Acrylic Resin + Glass Panels	
Jali®	The geometric or organic internal patterns of Jali® Glass filter ambient or day light to create a complex interplay of shadow, movement, light, and color. This effect of the material on an environment creates continuous, functional and connected spaces. Available in a variety of glass options – clear, low iron, mirrored, and other shades - Jali® Glass with its integral faceting technology is a durable material with a high fire rating and properties of safety glass and is able to be effortlessly maintained.
Scintilla®	Each Scintilla® panel is internally structured to have thousands of light conducting channels. These optical pathways activate the panels giving them a magically interactive surface which responds to the shadows, movements, lights and colors around it - no power needed!
Lumina™	The Lumina™ panel is a revolutionary material that transforms a single energy efficient LED light source into an entire surface within which thousands of points of light appear to float. Lumina™ panels not only allow the creation of ever changing “walls” of light, whose color can be renewed, they also extend the usability of intense LED point sources by radiating their brightness and allowing one to build with light itself.
SLANT®	SLANT® panels are imprints of natural phenomena etched into a crystalline resin substrate. Named after each inspiring phenomenon, the patterns available with glass cladding are Chaos, Mesh, Shutter, Sleet and Wave. These elegant, light-weight and versatile system of panels unleash a dynamic play of light in any space.



PRODUCT SPECIFICATIONS

Table 1 provides a summary of the product specifications for Sensitile Systems Acrylic Resin Panels with Glass.

Table 1. Summary of product specifications for Sensitile Systems acrylic resin panels with glass cladding.

Scintilla® Panels (with glass)	
Property	Value
Type:	Interactive Laminated Glass
Core Material:	PMMA
Cladding Material:	Glass
Weight:	9.75 lbs/sq. ft. - 19.75 lbs/sq. ft. (48 kg/m ² - 96 kg/m ²)
Core Thickness:	1/2"; 1"; or 2" (13 mm; 25 mm; or 51 mm)
Front Cladding Thickness	Glass: 1/4" (6.4 mm)
Total Panel Thickness	1" - 2-1/2" (25 mm - 64 mm)

Jali® Panels (with glass)	
Property	Value
Type:	Light-Filtering Laminated Glass
Core Material:	PMMA
Cladding Material:	Glass
Weight:	8.25 lbs/sq. ft. - 19.75 lb/sq. ft. (40 kg/m ² - 96 kg/m ²)
Cladding Thickness:	Glass: 1/4" (6.4 mm)
Total Panel Thickness:	3/4" (standard) - 2-1/2" (19 mm - 64 mm)

Lumina™ Panels (with glass)	
Property	Value
Type:	Light-Emitting Laminated Glass Panel
Core Material:	PMMA
Cladding Material:	Glass
Weight:	9.75 lbs/sq. ft. - 19.75 lbs/sq. ft. (48 kg/m ² - 96 kg/m ²)
Cladding Thickness:	Glass: 1/4" (6.4 mm)
Total Panel Thickness:	1" - 2-1/2" (25 mm - 64 mm)

SLANT® Panels (with glass)	
Property	Value
Type:	Light Filtering Laminated Glass
Core Material:	PMMA
Cladding Material:	Glass
Weight:	7 lb/sq. ft. - 13 lb/sq. ft. (34 kg/m ² - 63 kg/m ²)
Cladding Thickness:	Glass: 1/4" (6.4 mm)
Total Panel Thickness:	3/4" - 1-1/2" (19 mm - 38 mm)

PRODUCT PERFORMANCE

Table 2 provides a summary of the product performance for Sensitile Systems Acrylic Resin Panels with Glass.

Table 2. Summary of product performance for Sensitile Systems acrylic resin panels with glass cladding.

Property	Test Method	Result
Hardness	Mohs Scale	5-6.5
Coefficient of linear thermal expansion	ASTM D696	0.000005 in./in. ° F
Self-ignition temperature	ASTM D1929	>850 °F*
Flammability rating	ASTM E84	Flame Spread Index 50 Smoke Developed Index 350
Acoustic Transmission	ASTM E-90	For 3/4" thick panel STC 40; OITC 36
VOC Emissions	California Specification 01350	Zero VOC emissions*
Safety Glass Impact Test	ANSI Z97	Pass

*Based upon results of PMMA resin and/or known values of glass.

PRODUCT COMPOSITION

A summary of the composition for Acrylic Resin Panels with Glass is shown in Table 3.

Table 3. Summary of the material composition for Sensitile Systems Acrylic Resin Panels with Glass*.

Material Component	Material Function	Weight %
Annealed	Cladding	67%
Extruded Acrylic (PMMA) resin	Panel Core	28%
High Performance Interlayer	Laminate	5.2%

*LED light sources are available as an accessory, but not included in the LCA and EPD.



LIFE CYCLE ASSESSMENT STAGES & REPORTED INFORMATION

This EPD represents the Production Stage ('cradle-to-gate') life cycle potential impacts for Sensitile Systems Acrylic Resin Panels with Glass. Because the full life cycle is not declared, the product Reference Service Life (RSL) is not specified.

Table 4. The declared life cycle stages are marked with an X. MND = Module Not Declared.

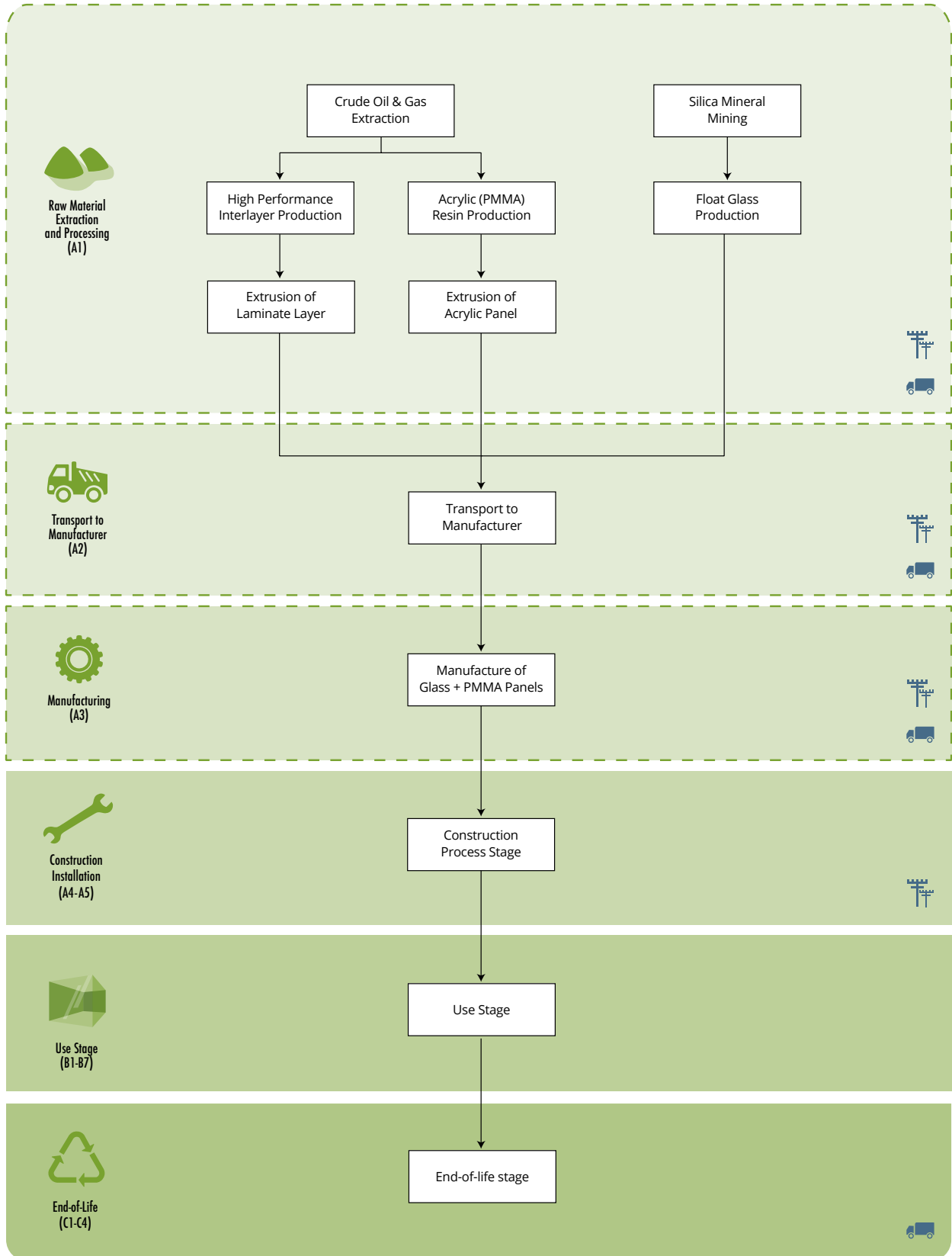
Product			Construction Process		Use							End-of-life				Benefits & loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B1	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw Material Extraction and Processing	Transport to Manufacturing	Manufacturing	Transport	Construction - Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X = included, MND = module not declared



PRODUCT LIFE CYCLE FLOW DIAGRAM

The diagram below is a representation of the most significant contributions to the production of Sensitile Systems Acrylic Resin Panels with Glass. This includes resource extraction, transport, and product manufacture.



LIFE CYCLE IMPACT ASSESSMENT

Life cycle impact assessment is the process of converting the life cycle inventory results into a representation of environmental and human health impacts. For example, emissions of carbon dioxide, methane, and nitrous oxide (inventory data) together contribute to climate change (impact assessment). The impact assessment for the EPD is conducted in accordance with the requirements of the Product Category Rule (PCR). Impact category indicators results, estimated using the CML-IA v4.1 characterization methodology, include Global Warming Potential (100-year time horizon), Acidification Potential, Eutrophication Potential, Photochemical Oxidation Creation Potential, Ozone Depleting Potential and Abiotic Resource Depletion Potential. Impact category indicator results based on the TRACI v2.1 characterization methodology are also presented.

Table 5. Cradle-to-Gate CML Life Cycle Impact Assessment Results for 1 m² of Sensitile Systems Acrylic Resin Panels with Glass. Contribution to result total shown as a percentage.

Indicator	Unit	Production Stage				Total
		Module A1 - Sourcing/ Extraction	Module A2 - Transport	Module A3 - Manufacturing		
				Panel Production	Panel Fabrication	
Global Warming Potential, 100 year time horizon	kg CO ₂ eq	90	7.9	130	14	240
		37%	3.2%	54%	5.9%	100%
Acidification Potential	kg SO ₂ eq	0.59	3.1x10 ⁻²	0.92	0.10	1.6
		36%	1.9%	56%	6.2%	100%
Eutrophication Potential	kg PO ₄ ³⁻ eq	8.7x10 ⁻²	7.1x10 ⁻³	0.25	2.6x10 ⁻²	0.37
		23%	1.9%	68%	6.9%	100%
Photochemical Ozone Creation Potential	kg C ₂ H ₄ eq	2.6x10 ⁻²	1.3x10 ⁻³	3.8x10 ⁻²	4.1x10 ⁻³	6.9x10 ⁻²
		37%	1.9%	55%	5.9%	100%
Ozone Depletion Potential	kg CFC-11 eq	6.8x10 ⁻⁶	1.4x10 ⁻⁶	2.3x10 ⁻⁶	2.1x10 ⁻⁷	1.1x10 ⁻⁵
		63%	13%	21%	2.0%	100%
Abiotic Depletion Potential, (Elements)	kg Sb eq	1.4x10 ⁻⁴	2.3x10 ⁻⁵	3.2x10 ⁻⁵	2.6x10 ⁻⁶	1.9x10 ⁻⁴
		70%	12.0%	17%	1.36%	100%
Abiotic Depletion Potential, (Fossil)	MJ eq	1,500	130	1,600	170	3,300
		45%	3.8%	47%	5.0%	100%

Table 6. Cradle-to-Gate TRACI Life Cycle Impact Assessment Results for 1 m² of Sensitile Systems Acrylic Resin Panels with Glass. Contribution to result total shown as a percentage.

Indicator	Unit	Production Stage				Total
		Module A1 - Sourcing/ Extraction	Module A2 - Transport	Module A3 - Manufacturing		
				Panel Production	Panel Fabrication	
Global Warming Potential, 100 year time horizon	kg CO ₂ eq	73	4.4	130	14	220
		33%	2.0%	59%	6.4%	100%
Acidification Potential	kg SO ₂ eq	0.48	2.0x10 ⁻²	0.86	9.6x10 ⁻²	1.5
		33%	1.4%	59%	6.6%	100%
Eutrophication Potential	kg N eq	9.9x10 ⁻²	4.9x10 ⁻³	0.54	5.4x10 ⁻²	0.70
		14%	0.70%	77%	7.7%	100%
Photochemical Ozone Creation Potential	kg O ₃ eq	4.7	0.47	6.0	0.64	12
		40%	4.01%	51%	5.4%	100%
Ozone Depletion Potential	kg CFC-11 eq	7.6x10 ⁻⁶	1.1x10 ⁻⁶	4.4x10 ⁻⁶	4.3x10 ⁻⁷	1.4x10 ⁻⁵
		56%	7.9%	32%	3.2%	100%



Table 7. Cradle-to-Gate energy resources and water use results for 1 m² of Sensitile Systems Acrylic Resin Panels with Glass.

Indicator	Unit	Production Stage				Total
		Module A1 - Sourcing/ Extraction	Module A2 - Transport	Module A3 - Manufacturing		
				Panel Production	Panel Fabrication	
Use of renewable primary energy excluding the renewable primary energy resources used as raw materials [PERE]	Mj eq.	51	1.5	250	5.3	310
		17%	0.50%	81%	1.7%	100%
Use of renewable primary energy resources used as raw materials [PERM]	Mj eq.	-	-	-	-	-
		0%	0%	0%	0%	0%
Total use of renewable primary energy resources [PERT]	Mj eq.	51	1.5	250	5.3	310
		17%	0.50%	81%	1.7%	100%
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials [PENRE]	Mj eq.	INA	INA	INA	INA	INA
		INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials [PENRM]	Mj eq.	INA	INA	INA	INA	INA
		INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources [PENRT]	Mj eq.	770	130	1,800	200	2,900
		26%	4.3%	63%	6.8%	100%
Use of secondary materials [SM]	kg	-	-	-	-	-
		0%	0%	0%	0%	0%
Use of renewable secondary fuels [RSF]	Mj eq.	Negligible	Negligible	Negligible	Negligible	Negligible
		Negligible	Negligible	Negligible	Negligible	Negligible
Use of non-renewable secondary fuels [NRSF]	Mj eq.	Negligible	Negligible	Negligible	Negligible	Negligible
		Negligible	Negligible	Negligible	Negligible	Negligible
Net use of fresh water resources [FW]	m ³	3.1	8.7x10 ⁻²	3.9	0.43	7.5
		41%	1.2%	52%	5.7%	100%

INA = Indicator not assessed

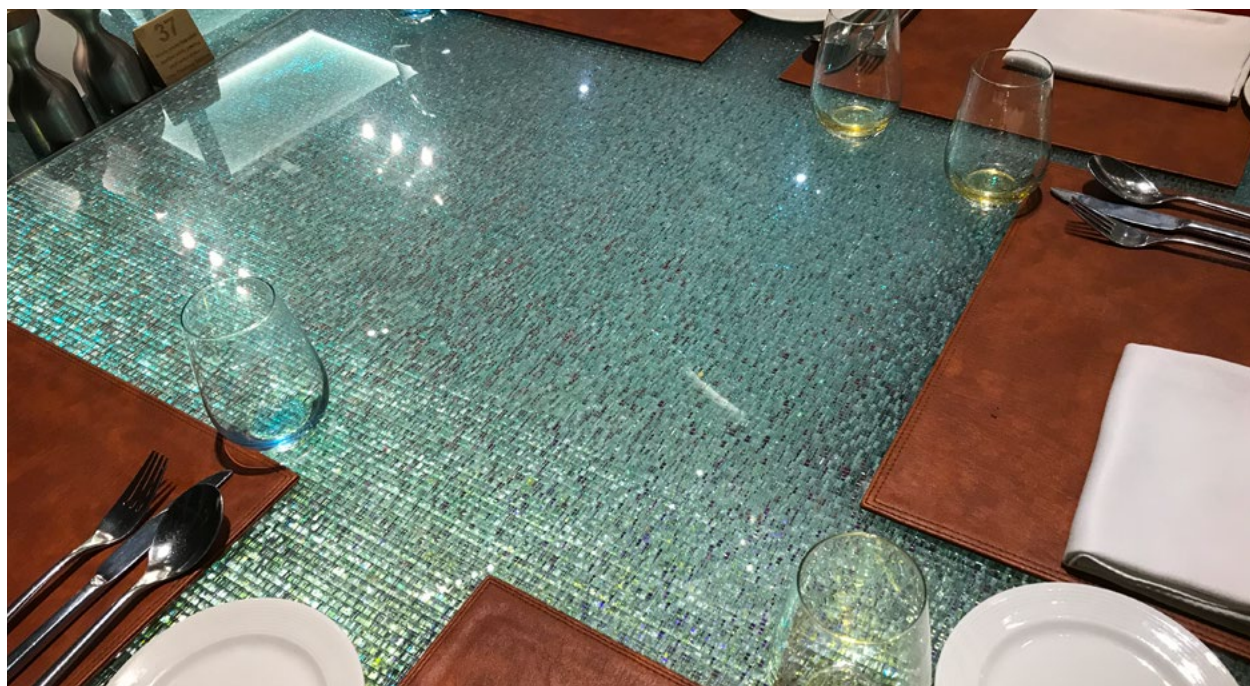




Table 8. Cradle-to-Gate waste results for 1 m² of Sensitile Systems Acrylic Resin Panels with Glass.

Indicator	Unit	Production Stage				Total
		Module A1 - Sourcing/ Extraction	Module A2 - Transport	Module A3 - Manufacturing		
				Panel Production	Panel Fabrication	
Hazardous waste disposed [HWD]	kg	4.3x10 ⁻⁴	7.1x10 ⁻⁵	2.8x10 ⁻³	3.1x10 ⁻⁴	3.6x10 ⁻³
		12%	2.0%	78%	8.6%	100%
Non-hazardous waste disposed [NHWD]	kg	3.1	5.6	11	0.39	20
		16%	28%	54%	2.0%	100%
Radioactive waste disposed [RWD]	kg	1.7x10 ⁻³	8.2x10 ⁻⁴	2.9x10 ⁻³	3.1x10 ⁻⁴	5.8x10 ⁻³
		30%	14%	50%	5.3%	100%

SUPPORTING TECHNICAL INFORMATION

Data Sources

Unit processes were developed with SimaPro 8.2, drawing upon data from multiple sources. Primary data were provided by Sensitile Systems. The primary source of secondary LCI data was the Ecoinvent database.

Table 9. Data sources used for the LCA.

Material	Flow Name	Data Source	Publication Date
Extruded Acrylic (PMMA) resin	Polymethyl methacrylate production, sheet ¹	Plastics Europe ²	2015
Annealed Glass	Flat glass, uncoated {GLO} market for Alloc Rec	Ecoinvent v3.2	2015
High Performance Interlayer	CONFIDENTIAL	Ecoinvent v3.2	2015

¹ Modified for recycled content

² Plastics Europe ecoprofiles. <http://www.plasticseurope.org/plastics-sustainability-14017/eco-profiles.aspx>

Data Quality

Table 10. Data quality of Life Cycle Inventory.

Parameter Description	Data Quality Discussion
<p>Time-Related Coverage: Age of data and the minimum length of time over which data is collected.</p>	<p>The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are representative of 2015 or more recent. All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on annual production for 2015.</p>
<p>Geographical Coverage: Geographical area from which data for unit processes is collected.</p>	<p>The data used in the analysis provide the best possible representation available with current data. Actual processes for upstream operations are primarily North American. Surrogate data used in the assessment are representative of North American or European operations. Data representative of European operations are considered sufficiently similar to actual processes. Data representing product disposal are based on US statistics.</p>
<p>Technology Coverage: Specific technology or technology mix</p>	<p>For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative fabrication datasets, specific to the type of material, are used to represent the actual processes, as appropriate.</p>
<p>Precision: Measure of the variability of the data values for each data expressed.</p>	<p>Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.</p>
<p>Completeness: Percentage of flow that is measured or estimated</p>	<p>The LCA model included all known mass and energy flows for production of the construction products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded. In total, these missing data represent less than 5% of the mass or energy flows.</p>
<p>Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest</p>	<p>Data used in the assessment represent typical or average processes as currently reported from multiple data sources, and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.</p>
<p>Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis</p>	<p>The consistency of the assessment is considered to be high. Data sources of similar quality and age are used with a bias towards Ecoinvent v3.2 data where available. Different portions of the product life cycle are equally considered.</p>
<p>Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study</p>	<p>Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.</p>
<p>Sources of the data: Description of primary and secondary data sources</p>	<p>Data representing energy use at the Sensitile Systems' Michigan facility represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. The Ecoinvent v3.2 database is used for secondary LCI datasets. The Plastics Europe eco-profile database was sourced for some plastics LCI data.</p>
<p>Uncertainty of the information: E.g. data, models, and assumptions</p>	<p>Uncertainty related to materials in the panel and tile products and packaging is low. Actual supplier data for upstream operations was sought but not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years), but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.</p>

Allocation

Resource use at the manufacturing facility in Ypsilanti, Michigan (e.g., water and energy) was allocated to the product based on square footage of the product as a fraction of the total facility production volume.

The Sensitile Systems' acrylic resin and glass panels include recycled materials, which were allocated using the recycled content allocation method (also known as the 100-0 cut off method). Using the recycled content allocation approach, system inputs with recycled content do not receive any burden from the previous life cycle other than reprocessing of the waste material.

Impacts from transportation were allocated based on the mass of material and distance transported.

System boundaries

The EPD for Sensitile Systems' products is cradle-to-gate (i.e., Production Stage). The system boundaries for this study are as follows:

- **Sourcing/extraction stage (A1)** – This stage includes extraction of virgin materials and reclamation of non-virgin feedstock. Resource use and emissions associated with both extraction of the raw materials product component manufacturing are included. Upstream transportation is also included.
- **Transport to manufacturing stage (A2)** – This stage includes all the relevant manufacturing processes and flows, including packaging. Production of capital goods, infrastructure, production of manufacturing equipment, and personnel-related activities are not included.
- **Manufacturing stage (A3)** – This stage includes all the relevant manufacturing processes and flows, including packaging. Production of capital goods, infrastructure, production of manufacturing equipment, and personnel-related activities are not included.

Cut-off criteria

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact must be included in the inventory. In the present study, except as noted, all known materials and processes were included in the life cycle inventory.

SUSTAINABILITY INITIATIVES AND PROGRAMS

Just as we are committed to excellence and innovation in the creation of our award-winning materials, we strive to find new ways to integrate sustainable practices into our manufacturing process and work culture.

These initiatives form a continuum as they involve the interrelated aspects of material and energy inputs, sustainability of production-processes and the socio-economic growth of people and the local community.

Material inputs and products properties

Our commitment to sustainability and the environment fuels our tireless efforts to increase the recycled content in our materials. The high degree of optical clarity required of our raw materials makes this quest challenging. However, we are pleased to announce a milestone achievement - nearly all our materials, including light fixtures, now incorporate at least 20% recycled content with some materials having up to 90% recycled content.

All of our materials are manufactured to the exact specifications of our customers, meaning that there is very little excess material stored in a warehouse. What little extra we produce is used in our aggressive and targeted sample program, which ensures that all these materials find a purpose.

Our materials have been designed to exploit the basic principles of optics to be able to harvest available ambient or efficient LED light sources, to create high impact, dynamic experiences in any environment, exponentially extending and maximizing light and allowing its emission from the most unlikely of surfaces.

Since no volatile compounds (VOCs) are emitted during the production of our materials or during their installed life-cycle, they do not have deleterious effects on the environment or indoor air quality attributable to off-gassing/ emissions.

Transparency is an important motivation in our drive to create and make available EPD (Environmental Product Declarations), HPD (Health Product Declarations) and LCA (Life-Cycle Assessment) for all our product lines.

Production Processes:

- Our equipment is optimized to minimum run times and temperatures. When available, all manufacturing equipment is variable speed, ensuring that minimal energy and resources are used in production.
- Our closed loop grey water recycling system ensures minimal consumption of “new” water in the plant operations
- Waste heat from compressors and other equipment is used for plant heating in winter
- We also harvest water from our large roofs for irrigating our landscape.
- No volatile compounds (VOCs) are emitted during the production of our materials
- We aggressively recycle all waste including cardboard, plastics, metals, paper and packaging

People and community

Plastic, cardboard, and paper are all recycled at local facilities and surplus packaging materials are reused by local artists for shipping their works of art.

We are dedicated to the upkeep and betterment of our community. In addition to supporting local vendors and the vast local talent pool making up our team, our building is a sterling example of our love for our community. In 2008, our current facility was a foreclosed property being used as storage by a bank. There were innumerable leaks in the ceiling and trees grew in the dock area.

Unusual for a manufacturing facility of our scale, we are located in a semi-residential area surrounded by churches, schools, and businesses, and the building’s condition was a blemish on the burgeoning community around it.

Once we moved in, we didn’t simply fix the leaks and cut the trees; we completely overhauled the property, installing state-of-the-art equipment and implementing systems that will ensure that our operation serves as a beacon of growth, renewability, and sustainability.

We are proud to maintain our local footprint by exclusively manufacturing in and shipping from Michigan, USA, using locally sourced raw-materials even though our unique products have found a place in numerous landmark projects globally.

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