

ENVIRONMENTAL PRODUCT DECLARATION

# CONTRAFLAM<sup>®</sup> 45/60/90/120

FIRE RATED SAFETY GLASS



*Contraflam is a fire-resistant tempered safety glass comprised of multiple layers with insulating intumescent layers. This product absorbs energy from a fire and reduces the transmission of heat.*



Protecting people and property from the hazard of fire is the key objective for our fire-resistant glass solutions. However, our glass also harnesses natural daylight in open-plan building designs – reducing the need for artificial light, and cutting heating and cooling costs.

In exterior applications, our products may be incorporated into double and triple glazing with solar control or low emissivity (low-e) features, contributing to maximizing the energy performance of a building.



# ENVIRONMENTAL PRODUCT DECLARATION





Contraflam® 45, Contraflam® 60, Contraflam® 90, Contraflam® 120  
Fire Rated Clear Laminated/Tempered Safety Glass

According to ISO 14025

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and ISO 21930. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. 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, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.



PROGRAM OPERATOR	UL Environment	
DECLARATION HOLDER	Vetrotech Saint-Gobain	
DECLARATION NUMBER	4786535815.101.1	
DECLARED PRODUCT	Contraflam® 45, Contraflam® 60, Contraflam® 90, Contraflam® 120	
REFERENCE PCR	GANA PCR for Flat Glass: UN CPC 3711	
DATE OF ISSUE	April 30, 2015	
PERIOD OF VALIDITY	5 years	
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications	
The PCR review was conducted by:	NSF International	
	Accepted by PCR Review Panel	
	ncss@nsf.org	
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL		
	Wade Stout, ULE	
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:		
	Thomas Gloria, Industrial Ecology Consultants	

## Product Definition and Information

### Product Description

Vetrotech Saint-Gobain’s fire-resistant glass Contraflam® offers the ultimate protection for people and property, while providing the aesthetic and multi-functional qualities expected from architectural glass. Our fire-rated glass is manufactured to provide multi-functional benefits, e.g. human impact, safety, security, etc. Parent company, Saint-Gobain, [ENERGY STAR Partner of the Year](#) for environmental responsibility, is the world’s largest building products manufacturer.

The functional unit of the products reported in this document is 1 metric tonne of flat glass with a service life of 30 years.

### Product line

<b>Contraflam® 45</b>	<b>Impact safety</b>	<b>Fire-rated clear safety glass</b>
<b>Contraflam® 60</b>	<b>Impact safety</b>	<b>Fire-rated clear safety glass</b>
<b>Contraflam® 90</b>	<b>Impact safety</b>	<b>Fire-rated clear safety glass</b>
<b>Contraflam® 120</b>	<b>Impact safety</b>	<b>Fire-rated clear safety glass</b>

#### FEATURES AND BENEFITS

Contraflam® is a  $\frac{3}{4}$ " to  $1\frac{9}{16}$ " thick laminated or tempered clear fire-rated safety glass offered in 45-120 minute fire ratings. The products install into standard fire rated frames.

- Tempered or fully laminated options
- Protects against smoke and flame
- Fulfills maximum human impact safety requirements per CPSC 16, CFR Part 201 CAT II.

### Manufacturing Locations

The manufacturing facilities that are involved in the production of the Contraflam product line are:

Kent, Washington	Auburn, Washington
------------------	--------------------

These facilities provided the primary data for this assessment and the results are based on the weighted average of production.

### Applications and Uses

Vetrotech Contraflam® products are for commercial use. Laminated and tempered versions of Contraflam® are used in fire rating installs to contain smoke and flames. Contraflam® fulfills maximum human impact safety requirements.

## Material Inputs

Material Components	Weight Percent	Mineral Resource	Renewable	Origin	Transportation Distance (km)
<b>Flat Glass</b>					
Silica	20% - 40%	Y	N	USA	250 – 5,500
Soda Ash	5% - 15%	Y	N	USA	1,000 – 2,000
Dolomite	5% - 15%	Y	N	USA	250 – 5,500
Limestone	<5%	Y	N	USA	250 - 5,500
Sodium Sulfate	<5%	Y	N	USA	250 – 5,500
Recycled Cullet	5% - 15%	N	Y	USA	250 – 5,500
<b>Laminate (Contraflam® 45 Only)</b>					
Laminating Film	<1%	N	N	USA	250 – 5,500
<b>Interlayer</b>					
Proprietary	20% - 40%	Y	N	Europe	15,000 – 20,000
<b>Seals</b>					
Polyisobutylene	<3%	N	N	Europe	15,000 – 20,000
Polysulfide	<3%	Y	N	Europe	15,000 – 20,000

Table 1: Product Formulation

The flat glass used in Contraflam® is comprised of a variety of minerals. Multiple lites of glass are sealed and filled with a unique fire-resistant interlayer material. Contraflam® 45 has lamination layer applied as well.

## Manufacturing Process

The flat glass is initially produced at a US facility. Raw materials are mixed into a batch and then melted into glass sheets of specified thicknesses. The glass sheets are then cooled and packaged. The glass is sent to another facility in Kent, Washington for annealing, tempering, lamination, and cutting. The cut glass is sent to the Auburn, Washington facility for final assembly.

At Auburn, the glass is washed, aligned, pressed, and sealed. The cavities are filled with the interlayer liquid, sealed again, and cured in an oven. The finished product is carefully packaged and loaded onto a truck for distribution.



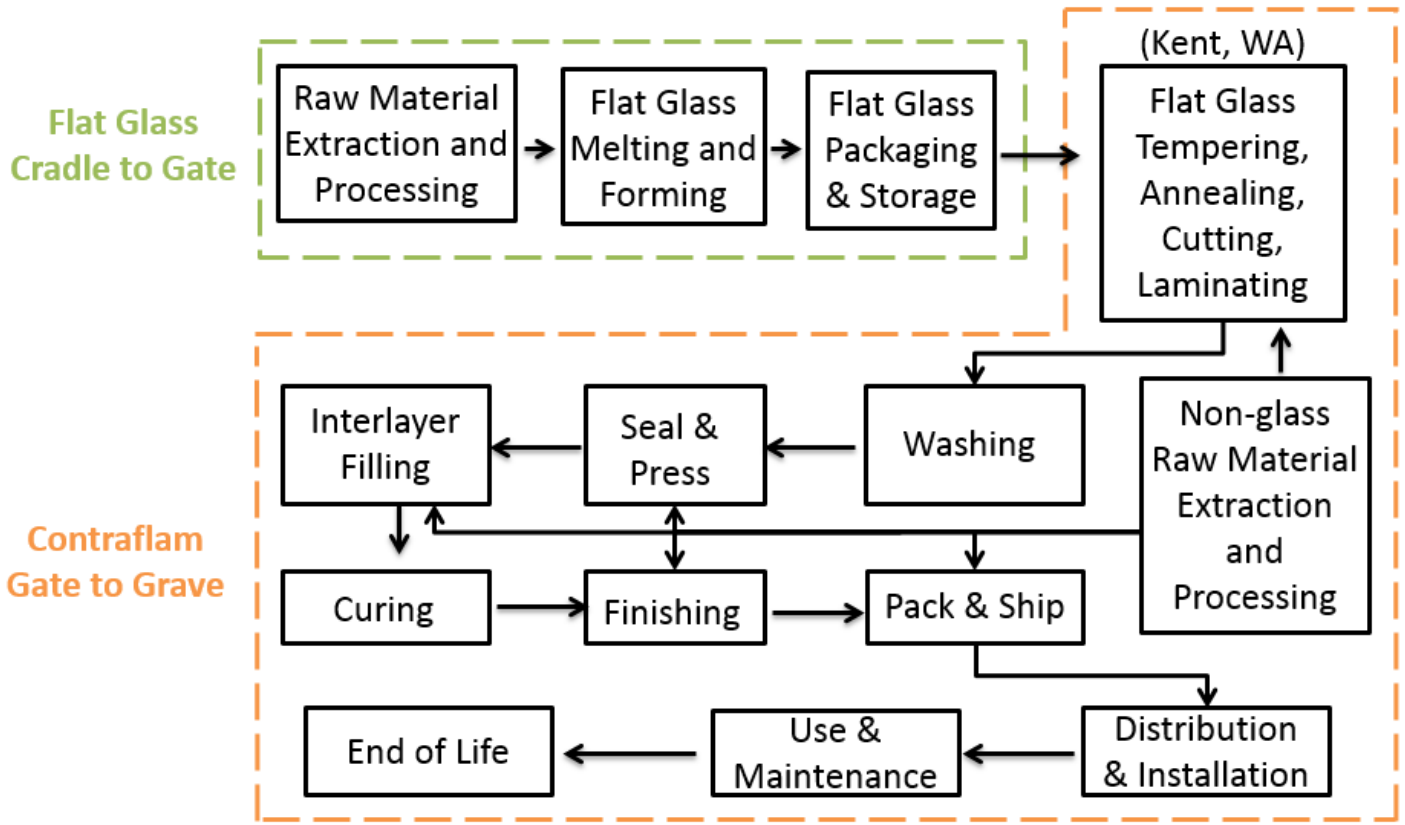


Figure 1: System Boundary of Vetrotech Contraflam® products

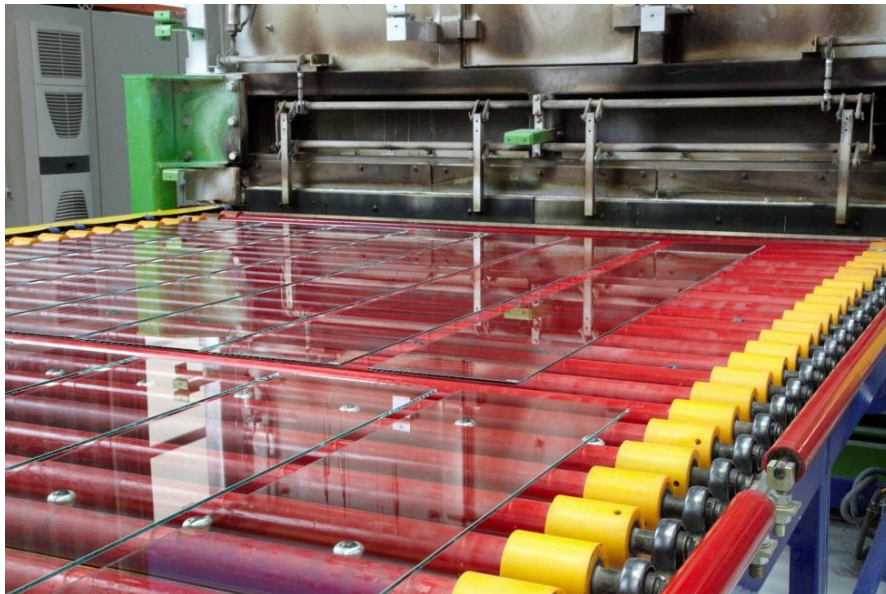


Figure 2: Photograph of flat glass manufacturing process

## Life Cycle Assessment Description

### Functional Unit

Environmental impacts are reported per functional unit of a product and the functional unit is the basis for comparison in an LCA. For flat glass, the functional unit is defined as 1 metric tonne of flat glass and a service life of 30 years.

As Contraflam® is produced in standard thicknesses, the following table shows the product area per the functional unit.

Contraflam® Product	Area per Functional Unit	Unit
<b>Contraflam® 45</b>	24.5	m <sup>2</sup> / tonne
<b>Contraflam® 60</b>	16.8	m <sup>2</sup> / tonne
<b>Contraflam® 90</b>	13.3	m <sup>2</sup> / tonne
<b>Contraflam® 120</b>	12.6	m <sup>2</sup> / tonne

Table 2: Glass area per metric tonne

### Life Cycle Stages Assessed

Life Cycle Boundary	EPD Life Cycle Stage
Contraflam® Flat Glass Cradle-to-Gate	Material Acquisition and Pre-processing
	Production
	Packaging/Storage
Contraflam® Gate-to-Grave	Post-Processing
	Contraflam Manufacturing
	Product Transport
	Use
	End of Life

Table 3: Life cycle stages assessed

### System Boundary

The life cycle analysis for Contraflam comprises the boundary stages from cradle-to-grave. It includes the flat glass production (extraction of raw materials, product manufacturing and packaging), product shipping to installation, use, and end-of-life stages, as shown in Figure 1. Manufacturing overhead (heating & lighting) was excluded in the system boundary. The life cycle impact assessment results are disclosed for separately for cradle-to-gate and gate-to-grave stages.

### Cut-off Criteria

Mass and energy flows that consist of less than 1% may be omitted from the inventory analysis. Cumulative omitted mass or energy flows shall not exceed 5%. Mass or energy flows that contribute more than 10% to an impact category shall be included.

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

## Period under Consideration

Secondary data was used for flat glass production. Primary data from calendar year 2014 was collected for the Kent, Washington and Auburn, Washington facilities.

## Software and Background Data

For life cycle modeling the SimaPro v8 Software System for Life Cycle Engineering was used. All background data sets relevant for production and disposal were available in this software.

## Transportation

The Auburn facility provided shipping distances of all raw materials which were used in this study. Interplant shipping was included. The final product is typically sold within the continental United States and transported by truck. Distribution shipping was accounted for in this study based on a scenario of a Chicago job site.

## Use Stage

The useful service life of the Contraflam product line is 30 years. Water and detergent were considered for maintaining the product during use.

## End-of-Life

Contraflam is usually removed and loaded onto a truck or dumpster at the decommissioning of a building. The product was modeled as being disposed of in a landfill. There are currently no end-of-life recycling programs formally established across the industry for fire rated glass.

## Life Cycle Inventory

### Emissions to Air

Emission	Unit	Raw Material Extraction and Processing	Flat Glass Production	Flat Glass Packaging/Storage	Total Cradle-to-Gate
SO <sub>x</sub>	kg	4.9E-01	4.9E+00	5.1E-04	5.4E+00
NO <sub>x</sub>	kg	4.0E-01	3.7E+00	4.6E-04	4.1E+00
CO <sub>2</sub>	kg	1.2E+02	8.5E+02	1.3E-01	9.6E+02
CO	kg	1.8E-01	2.0E-01	3.5E-04	3.8E-01
VOCs	kg	5.3E-02	2.8E-01	2.7E-04	3.4E-01
Fe	kg	2.3E-03	7.3E-04	5.2E-07	3.1E-03
PM	kg	2.6E-02	2.0E-01	3.6E-05	2.3E-01

Table 4: Cradle-to-gate air emissions per metric tonne of unfinished flat glass

Emission	Unit	Contraflam® 45 Cradle-to-Grave	Contraflam® 60 Cradle-to-Grave	Contraflam® 90 Cradle-to-Grave	Contraflam® 120 Cradle-to-Grave
SO <sub>x</sub>	kg	9.6E+00	8.0E+00	7.1E+00	6.8E+00
NO <sub>x</sub>	kg	1.1E+01	9.3E+00	9.1E+00	9.2E+00
CO <sub>2</sub>	kg	2.0E+03	1.7E+03	1.6E+03	1.6E+03
CO	kg	3.9E+00	3.2E+00	3.2E+00	3.2E+00
VOCs	kg	1.6E+00	1.2E+00	1.1E+00	1.1E+00
Fe	kg	3.3E-03	3.0E-03	2.9E-03	2.8E-03
PM	kg	2.9E-01	2.6E-01	2.5E-01	2.4E-01

Table 5: Cradle-to-grave air emissions per metric tonne of finished Contraflam®

## Water Use and Emissions to Water

Use/Emission	Unit	Material Acquisition and Pre-Processing	Flat Glass Production	Flat Glass Packaging/ Storage	Total Cradle-to- Gate
Water Use	kg	6.9E+03	5.1E+03	3.9E+00	1.2E+04
Phosphates	kg	1.2E-01	1.6E-01	9.4E-05	2.8E-01
Nitrates	kg	5.4E-02	6.4E-02	4.4E-05	1.2E-01
Dioxin	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Heavy Metals	kg	2.2E-03	1.6E-03	1.6E-06	3.8E-03

Table 6: Total cradle-to-gate water use and emissions per metric tonne of unfinished flat glass

Use/Emission	Unit	Contraflam® 45 Cradle-to-Grave	Contraflam® 60 Cradle-to-Grave	Contraflam® 90 Cradle-to-Grave	Contraflam® 120 Cradle-to-Grave
Water Use	kg	1.3E+04	1.2E+04	1.1E+04	1.1E+04
Phosphates	kg	4.6E-01	3.9E-01	3.8E-01	3.7E-01
Nitrates	kg	2.4E-01	2.0E-01	1.8E-01	1.8E-01
Dioxin	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Heavy Metals	kg	8.9E-03	7.4E-03	7.1E-03	7.1E-03

Table 7: Cradle-to-grave water use and emissions per metric tonne of finished Contraflam®

## Energy Resources

Primary Energy	Unit	Material Acquisition and Pre-Processing	Flat Glass Production	Flat Glass Packaging/ Storage	Total Cradle-to- Gate
Nonrenewable, fossil	MJ-Eq	1.4E+03	1.0E+04	2.6E+00	1.2E+04
Nonrenewable, nuclear	MJ-Eq	1.4E+02	4.3E+02	2.3E-01	5.7E+02
Renewable, biomass	MJ-Eq	4.0E+01	1.8E+01	8.6E-01	5.9E+01
Renewable wind, solar, geothermal	MJ-Eq	6.3E-01	2.1E+00	3.8E-03	2.7E+00
Renewable, water	MJ-Eq	2.5E+01	4.5E+01	4.7E-02	7.0E+01
<b>Total</b>	<b>MJ-Eq</b>	<b>1.6E+03</b>	<b>1.1E+04</b>	<b>3.7E+00</b>	<b>1.3E+04</b>

Table 8: Total cradle-to-gate primary energy use per metric tonne of unfinished flat glass



Primary Energy	Unit	Contraflam® 45 Cradle-to-Grave	Contraflam® 60 Cradle-to-Grave	Contraflam® 90 Cradle-to-Grave	Contraflam® 120 Cradle-to-Grave
Nonrenewable, fossil	MJ-Eq	3.1E+04	2.5E+04	2.3E+04	2.3E+04
Nonrenewable, nuclear	MJ-Eq	9.4E+02	8.0E+02	7.5E+02	7.4E+02
Renewable, biomass	MJ-Eq	1.8E+03	1.3E+03	1.0E+03	9.7E+02
Renewable wind, solar, geothermal	MJ-Eq	4.0E+00	3.4E+00	3.0E+00	2.8E+00
Renewable, water	MJ-Eq	1.2E+02	1.0E+02	8.9E+01	8.4E+01
<b>Total</b>	<b>MJ-Eq</b>	<b>3.4E+04</b>	<b>2.8E+04</b>	<b>2.5E+04</b>	<b>2.5E+04</b>

Table 9: Cradle-to-grave primary energy use per metric tonne of finished Contraflam®

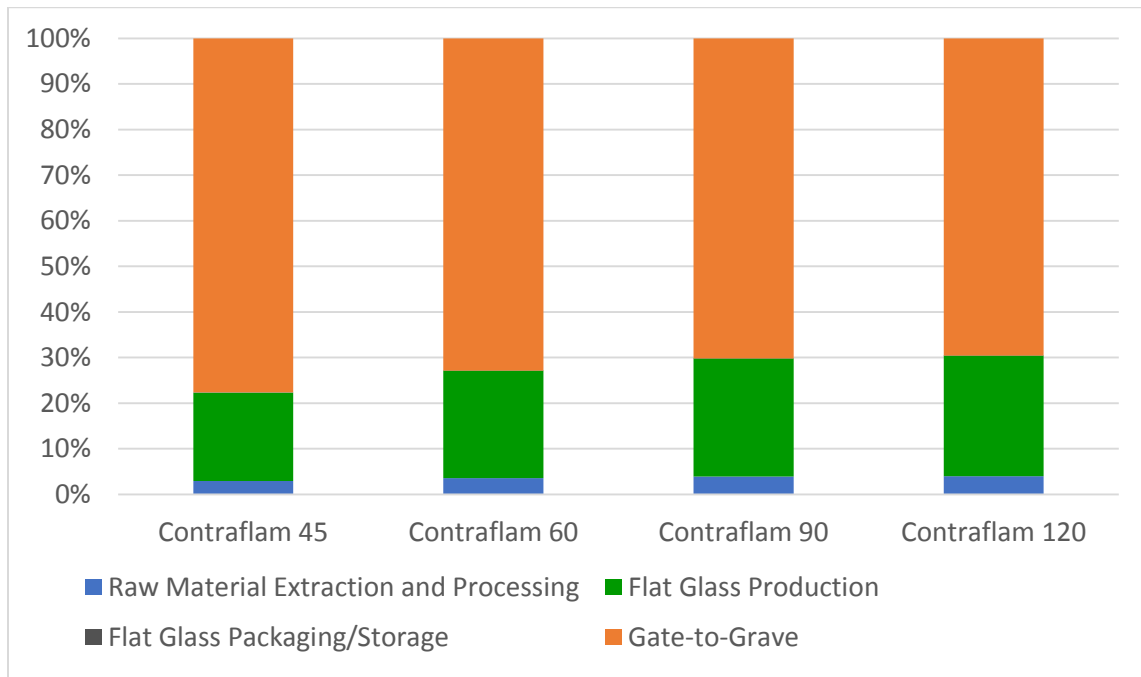


Figure 4: Cradle to Grave Cumulative Energy Demand of the Contraflam product line.

## Waste Management

Waste	Unit	Raw Material Extraction and Processing	Flat Glass Production	Flat Glass Packaging/ Storage	Total Cradle-to- Gate
Incineration (includes with and without energy recovery)	kg	6.8E+00	2.4E+00	9.0E-04	9.2E+00
Landfill (non-hazardous solid waste)	kg	2.3E+02	2.5E+02	8.0E-02	4.8E+02
Hazardous waste	kg	4.5E-02	1.2E-01	6.1E-05	1.7E-01
Landfill avoidance (recycling)	kg	2.6E-05	1.8E-05	1.0E-08	4.3E-05

Table 10: Total cradle-to-gate waste per metric tonne of unfinished flat glass

Waste	Unit	Contraflam® 45 Cradle-to-Grave	Contraflam® 60 Cradle-to-Grave	Contraflam® 90 Cradle-to-Grave	Contraflam® 120 Cradle-to-Grave
Incineration (includes with and without energy recovery)	kg	1.4E+01	1.2E+01	1.1E+01	1.1E+01
Landfill (non-hazardous solid waste)	kg	4.3E+03	3.7E+03	3.6E+03	3.7E+03
Hazardous waste	kg	3.6E+00	2.5E+00	2.2E+00	2.1E+00
Landfill avoidance (recycling)	kg	3.8E+00	2.6E+00	2.8E+00	3.0E+00

Table 11: Cradle-to-grave waste per metric tonne of finished Contraflam®

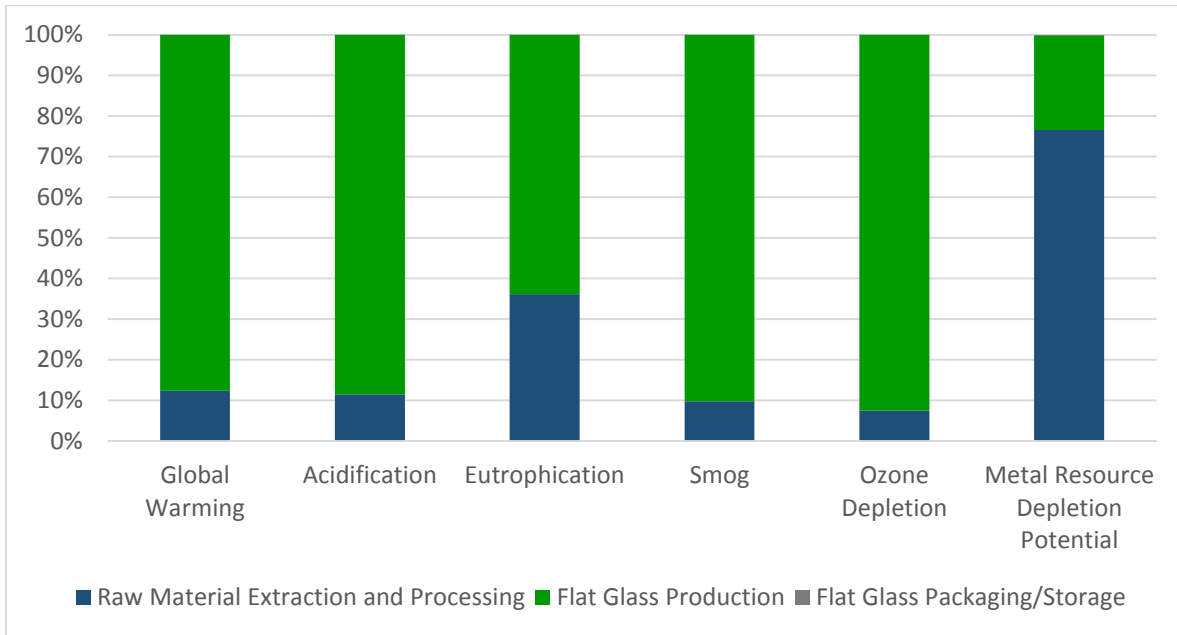
## Life Cycle Impact Assessment

The environmental impacts listed below were assessed throughout the life cycle of Contraflam® as defined above.

Impact Category	Units	Raw Material Extraction and Processing	Flat Glass Production	Flat Glass Packaging/ Storage	Total Cradle- to-Gate*
<b>Global warming</b>	kg CO <sub>2</sub> eq	1.2E+02	8.7E+02	1.4E-01	1.0E+03
<b>Acidification</b>	kg SO <sub>2</sub> eq	1.0E+00	7.7E+00	8.7E-04	8.7E+00
<b>Eutrophication</b>	kg N eq	3.8E-01	6.7E-01	3.1E-04	1.1E+00
<b>Smog</b>	kg O <sub>3</sub> eq	9.9E+00	9.1E+01	1.3E-02	1.0E+02
<b>Ozone Depletion</b>	kg CFC-11 eq	8.2E-06	1.0E-04	8.2E-09	1.1E-04
<b>Metal Resource Depletion Potential**</b>	kg Fe eq	9.2E+00	2.8E+00	1.6E-02	1.2E+01

\*May not sum due to rounding

\*\*Metal Resource Depletion Potential is calculated with ReCiPe Midpoint v1.10 Metal Depletion methodology  
Table 12: Cradle-to-gate life cycle impact assessment results per metric tonne of unfinished flat glass



Impact Category	Units	Figure 5: Cradle-to-Grave Environmental Impact Assessment of Flat Glass			
		Contraflam® 90 Cradle-to-Grave	Contraflam® 100 Cradle-to-Grave	Contraflam® 110 Cradle-to-Grave	Contraflam® 120 Cradle-to-Grave
<b>Global warming</b>	kg CO <sub>2</sub> eq	2.2E+03	1.8E+03	1.7E+03	1.7E+03
<b>Acidification</b>	kg SO <sub>2</sub> eq	1.9E+01	1.6E+01	1.5E+01	1.4E+01
<b>Eutrophication</b>	kg N eq	2.2E+00	1.8E+00	1.8E+00	1.8E+00
<b>Smog</b>	kg O <sub>3</sub> eq	2.8E+02	2.4E+02	2.3E+02	2.3E+02
<b>Ozone Depletion</b>	kg CFC-11 eq	1.3E-04	1.2E-04	1.1E-04	1.1E-04
<b>Metal Resource Depletion Potential**</b>	kg Fe eq	8.8E+01	6.3E+01	5.5E+01	5.4E+01

\*\*Metal Resource Depletion Potential is calculated with ReCiPe Midpoint v1.10 Metal Depletion methodology  
Table 13: Cradle-to-grave life cycle impact assessment results per metric tonne of Contraflam®

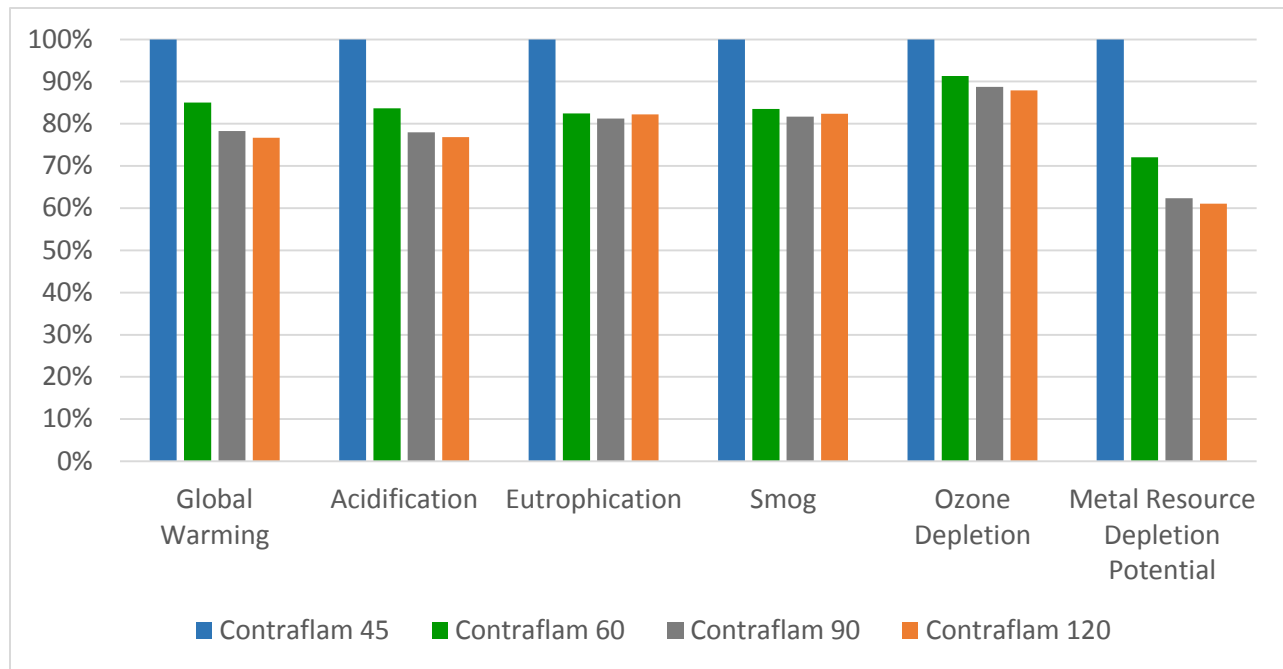


Figure 6: Cradle to Grave Environmental Impact Assessment of Contraflam Product Line.

## Optional Environmental Information

### Organizational Awards

Saint-Gobain has been awarded the ENERGY STAR Partner of the Year Sustained Excellence Award for 2015 for the fifth straight year for the corporation's innovations in sustainable operations and manufacturing.



### References

- ASTM E119-14 Standard Test Methods for Fire Tests of Building Construction and Materials
- ASTM E1991-05 Standard Guide for Environmental Life Cycle Assessment (LCA) of Building Material/Products
- ASTM E2114-08 Standard Technology for Sustainability Relative to the Performance of Buildings
- ASTM E2129-10 Standard Practice for Data Collection for Sustainability Assessment of Building Products
- ASTM E2432-11 Standard Guide for General Principles of Sustainability Relative to Buildings
- CAN/CGSB-12.1-M Tempered or Laminated Safety Glass
- CAN/ULC-S101, S104, S106 Fire Endurance Tests of Building Construction and Materials; Fire Tests of Door Assemblies; Standard Method for Fire Tests of Window and Glass Block Assemblies
- CPSC 16CFR Part 1201 (Category II) – Safety Standard for Architectural Glazing

- EN 15804:2012 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
- GANA PCR for Flat Glass UN CPC 3711. V1.
- (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*
- ISO 21930, Sustainability in building construction – Environmental declaration of building products
- NFPA 80, NFPA 251, NFPA 252, NFPA 257
- RIVM and Raboud University, CML, PRe Consultants, ReCiPe 1.10 methodology, [www.lcia-recipe.net](http://www.lcia-recipe.net)
- UL 9, UL 10b, UL 10c – Fire Tests of Window Assemblies; Fire Tests of Door Assemblies; Positive Pressure Fire Tests of Door Assemblies
- UL 263 – Fire Tests of Building Construction and Materials
- USEPA Waste Reduction Model (WARM)
- World Resources Institute (WRI) Draft Product Life Cycle Accounting and Reporting Standard

### LCA Development

---

This EPD and corresponding LCA were prepared by Sustainable Solutions Corporation of Royersford, Pennsylvania.



**SustainableSolutions**  
CORPORATION

### Contact Vetrotech

---

For more information, please visit <http://www.vetrotech.com/usa/About-Vetrotech-USA/Contact-Vetrotech.aspx>