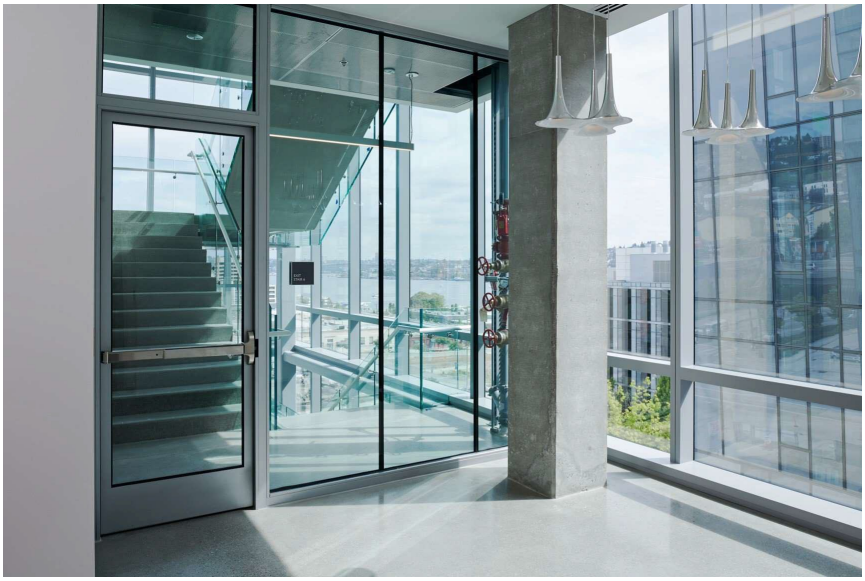
ENVIRONMENTAL PRODUCT DECLARATION

CONTRAFLAM® PRODUCT FAMILY

CONTRAFLAM 60, CONTRAFLAM STRUCTURE 60, CONTRAFLAM 90, CONTRAFLAM 120, CONTRAFLAM STRUCTURE 120

FIRE RATED SAFETY GLASS



CONTRAFLAM is a single- or multi-chambered fire-resistant tempered safety glass containing an environmentally-progressive intumescent interlayer. In the event of fire, it offers full heat insulation for the compartmentalization of fire.

Completely moisture-resistant, the interlayer expands as an opaque foam in the event of fire, limiting heat transmission and reducing panic by blocking the view to the affected area. Insulated glazing units are available, providing significant potential for energy savings through enhanced thermal insulation as well as the application of high-performance low-emissivity and/or solar control coatings.

CONTRAFLAM STRUCTURE is a patented flush butt-joint glass solution without vertical frame profiles that uses CONTRAFLAM to ensure fire-resistive properties for up to 120 minutes. The floor-to-ceiling glazing resembles a continuous, uninterrupted glass wall jointed only with silicone, allowing the building to be flooded with natural daylight without compromising on safety.

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Vetrotech's glass solutions meet internationally recognized environmental standards at every stage of their life cycles. Our products support you in gaining points for sustainable building labels such as LEED, BREAM, WELL, DGNB, HQE and others.

We strive to deliver innovative solutions that enable our customers to build and renovate safe, sustainable and comfortable buildings. Installing our glass in an office can contribute to ensuring the right amount of daylight, increasing productivity by 18% while at the same time protecting against attacks or fire.

Vetrotech belongs to the Saint-Gobain group, the world's largest building materials company. Saint-Gobain has been creating and delivering innovative and high performance solutions to enhance habitat and daily life for over 350 years.

Saint-Gobain is committed to providing sustainable products and to limiting our impacts on the environment while doing so. (See our CSR at https://www.saint-gobain.com/en/corporate-responsibility)

For more information, visit www.vetrotech.com/sustainability.

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

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Contraflam® Product Family

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

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. 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	4789836129.102.1
DECLARED PRODUCT	Vetrotech Contraflam Family Products: Fire Rated Safety Glass
REFERENCE PCR	UL Environment PCR Part B – Processed Glass EPD Requirements. Version 1.0 2016.
REFERENCE PCR STANDARD	☒ EN 15804 (2012) ☒ ISO 21930 (2017) ☐ ISO 21930 (2007)
DATE OF ISSUE	April 1, 2021
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:	UL Environment Thomas P. Gloria, Ph.D, Chair epd@ulenvironment.com
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	Grant R. Martin Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas Gloria Tom Gloria, Industrial Ecology Consultants

This EPD conforms with ISO 21930:2017 & EN 15804

Environmental Product Declaration

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Product Documentation

Product Description

Contraflam is a multi-chamber fire-resistant glass made of tempered safety glass and sealed to be completely moisture resistant.

The chambers are filled with an environmentally friendly, transparent and UV-stable alkaline silicate based chemical mixture “interlayer” which reacts in the event of fire. The product is offered in different configurations based on customer preference; typically, 60, 90, and 120 models. The number represents the minimum required time the glass can withstand flame.

All types of Contraflam include multiple panes of glass. Between each is an interlayer that is resistant to heat and flame. Increasing the number of intumescent layers increases the product’s performance to a higher fire/minute rating.

Contraflam installation at Mall of America

Contraflam Structure products also offer fire resistance with 60 or 120 minutes of flame resistance, but include “butt-joint” solutions to resemble a continuous, uninterrupted glass wall jointed with silicone. Contraflam Structure models are typically thicker and heavier than the non-Structure counterparts, but are otherwise similarly engineered and manufactured.

Application

Classified as fire-resistive and referred to in the IBC as “transparent wall assemblies,” Vetrotech Contraflam products can be substituted in full for opaque fire-rated wall assemblies. Laminated and tempered versions of Contraflam are used in fire rating installs to contain smoke and flames. Contraflam fulfills maximum human impact safety requirements.

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Technical Data

Contraflam Product Details							
CSI Code	*08800*						
UNSPSC Code	*301717*						
Contraflam Technical Data							
	Fire Rating, minutes	**Visible light transmission, %**	**U-factor, btu/°F.hr.ft²**	**STC Rating, dB**	**Impact Safety Rating**	**US Testing**	**Canadian Testing**
Contraflam 60	60	80	0.76	40	CPSC 16CFR 1201-CAT II, CAN/CGSB-12.1-M, ANSI Z97.1	UL 9, 10B, UL 10C, NFPA 80, NFPA 251, NFPA 252, NFPA 257, ASTM E119, UL 263	CAN/ULC S101, S104, S106
Contraflam Structure 60	60	83	0.70	42	CPSC 16CFR, 1201-CAT II, CAN/CGSB-12.1-M, ANSI Z97.1	UL 263, NFPA 251, ASTM E119	CAN/ULC S101
Contraflam 90	90	82	0.69	45	CPSC 16CFR, 1201-CAT II, CAN/CGSB-12.1-M, ANSI Z97.1	UL 9, 10B, UL 10C, NFPA 80, NFPA 252, NFPA 257	CAN/ULC S104, S106
Contraflam 120	120	79.3	0.57	41	CPSC 16CFR 1201, CAN/CGSB 12-1 M90, ANSI Z97.1	UL 263, NFPA 251, ASTM E119	CAN/ULC S101
Contraflam Structure 120	120	80	0.62	46	CPSC 16CFR, 1201-CAT II, CAN/CGSB-12.1-M, ANSI Z97.1	UL 263, NFPA 251, ASTM E119	CAN/ULC S101

Table 1: Contraflam Product Technical Details

Placing on the Market

The Contraflam family of products is certified by Underwriter Laboratories (UL) under the following Standards: UL 9, Standard for Fire Tests of Window Assemblies; UL 10b, Standard for Fire Tests of Door Assemblies; and UL 10c, Standard for Positive Pressure Fire Tests of Door Assemblies; as well as 263 (Standard for Fire Tests of Building Construction and Materials).

They conform with ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, as well as the National Fire Protection Association (NFPA) standards 80 (Standard for Fire Doors and Other Opening Protectives), 252 (Standard Methods of Fire Tests of Door Assemblies) and 257 (Standard on Fire Test for Window and Glass Block Assemblies).

In Canada, Contraflam products are certified under CAN/ULC S101 (Standard Methods of Fire Endurance Tests of building Construction and Materials), S104 (Standard Method for Fire Tests of Door Assemblies) and S106 (Standard Method for Fire Tests of Window and Glass Block Assemblies).

Contraflam products meet Impact Safety Ratings with the Consumer Product Safety Commission (CPSC) 16 CFR 1201 Cat. II standard, Safety Standard for Architectural Glazing Materials for products of unlimited size. Products also meet the Canadian General Standards Board (CGSB) CAN/CGSB-12.1-M impact safety standards for Tempered or Laminated Safety Glass and the American National Standards Institute (ANSI) Z97.1 Safety Glazing Materials Used in Buildings impact safety standard.

Delivery Status

Contraflam products available in custom sizes according to customer specification with area ranges that differ depending on the Contraflam product specified. The packaging consists of a wood crate with foam padding for support.

Contraflam Delivery Status	
	Maximum Exposed Area (m^2)
Contraflam 60	2.87
Contraflam Structure 60	4.89
Contraflam 90	2.05
Contraflam 120	2.90
Contraflam Structure 120	2.93

Table 2: Contraflam Delivery Status

Base Materials/Ancillary Materials

Contraflam Raw Materials						
Raw Material	**Contraflam 60**	**Contraflam Structure 60**	**Contraflam 90**	**Contraflam 120**	**Contraflam Structure 120**	**Weighted Average**
Flat Glass	63.50%	81.71%	67.26%	61.76%	72.62%	67.89%
Interlayer	33.30%	15.09%	29.54%	35.24%	24.38%	28.97%
Polysulfide Sealant	1.60%	1.60%	1.60%	1.50%	1.50%	1.57%
Butyl Sealant	1.6%	1.60%	1.60%	1.50%	1.50%	1.57%
Total kg/m^2:	**58.00**	**68.50**	**71.50**	**77.50**	**110.00**	**71.72**

Table 3: Contraflam Material Content

Manufacturing Location

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

Flat Glass Processing	Finishing
Hartung (Kent, Washington)	Auburn, Washington

Manufacturing

Vetrotech exclusively sources tempered, annealed, heat strengthened, and laminated glass from the nearby Hartung Glass facility in Kent, WA. Hartung in turn sources its flat glass from another manufacturer. Once the processed glass arrives at the Vetrotech Auburn, WA facility from the Hartung facility, the glass is first washed and inspected. Initial seals are applied and panes are layered according to the product specifications. Interlayer liquids are inserted between the layers of glass, additional seals applied, and then the product is cured in an oven for approximately 14-hours. After the oven, the product has a final seal applied and is then packaged for transport and distribution.

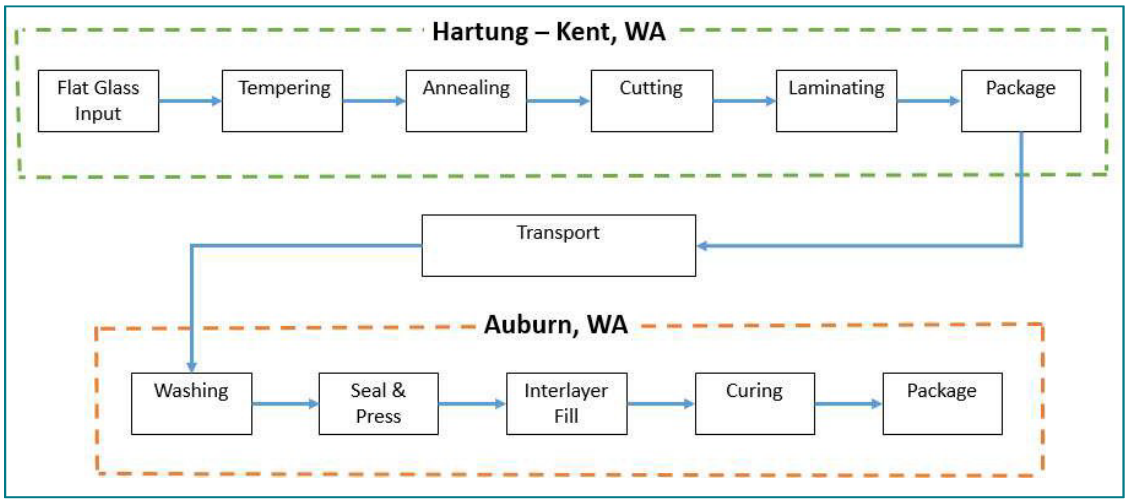

Figure 1: Contraflam Process Flow

Environment and Health During Manufacturing

Saint-Gobain has well-established Environmental, Health, and Safety (EHS) and product stewardship programs, which help to enforce proper evaluation and monitoring of chemicals and raw materials chosen to manufacture products. These programs ensure that all environmental and OSHA requirements are met or exceeded to ensure the health and safety of all employees and contractors.

The Auburn manufacturing facility operates integrated Environmental, Health, and Safety Management Systems that align with the ISO 14001 and ISO 45001 standards.

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Contraflam® Product Family

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Product Processing/Installation

Contraflam safety tempered glass fire-rated glazing material is for use in doors, windows, transoms, and sidelite assemblies where fire-resistive rated glazing is required.

Contraflam should be installed only into listed fire-rated assemblies using fire-rated setting blocks and/or one of the following: Ceramic Glazing Tape or Closed Cell PVC Tape. In addition, both tapes can be used in conjunction with cosmetic silicone sealant.

Additional installation guidelines are available on the Vetrotech website: www.vetrotech.com

Packaging

Packaging of the final product after production is included in the life cycle assessment. Packaging material includes wood crates with polystyrene foam padding for support.

Condition of Use

Vetrotech Contraflam should be handled with care during transportation, storage, inspection, and installation. In addition, it should be stored in a dry place.

Environment and Health During Use

Contraflam products have no known emissions during use that could affect the environment or human health.

No additional maintenance is required during the use of Contraflam products. Cleaning can be done with a typical glass cleaning solution as needed, in the same way as for conventional glass.

Extraordinary Effects

Fire, Water, and Mechanical Destruction

Contraflam products have no known extraordinary effects concerning fire, water, or mechanical destruction.

Re-Use/Recycling

Vetrotech and Saint-Gobain actively monitor and engage in on-going studies regarding processed glass recycling and disposal. At this time there are no end-of-life recycling programs formally established across the industry for fire rated glass.

Disposal

Contraflam is usually removed and loaded onto a truck or dumpster at the decommissioning of a building. The product's end-of-life is assumed to be inert in a landfill. Disposal in a municipal landfill or in commercial incineration facilities is permissible and should be done in accordance with local, provincial, and federal regulations.

Further Information

www.vetrotech.com

LCA Calculation Rules

Declared Unit

Declared Unit						
Name	**Unit**	**Contraflam 60**	**Contraflam Structure 60**	**Contraflam 90**	**Contraflam 120**	**Contraflam Structure 120**
Declared Unit	m2	1	1	1	1	1
Mass per declared unit	kg	58.0	68.5	71.5	77.5	110.0
Conversion factor to 1kg	-	0.017	0.015	0.014	0.013	0.009
Thickness	mm	25	31	37	39	52
Interlayer percent of mass	%	33.3	38.4	29.5	35.2	46.1

Table 4: Declared Unit Information

System Boundary

The life cycle analysis performed for this EPD is classified as a “cradle-to-gate” study. The system boundary includes raw material supply, raw material transport, and manufacture. Additional life cycle stages of transport from the manufacture to customer, installation, use, and end-of-life are excluded from this study as required by the PCR.

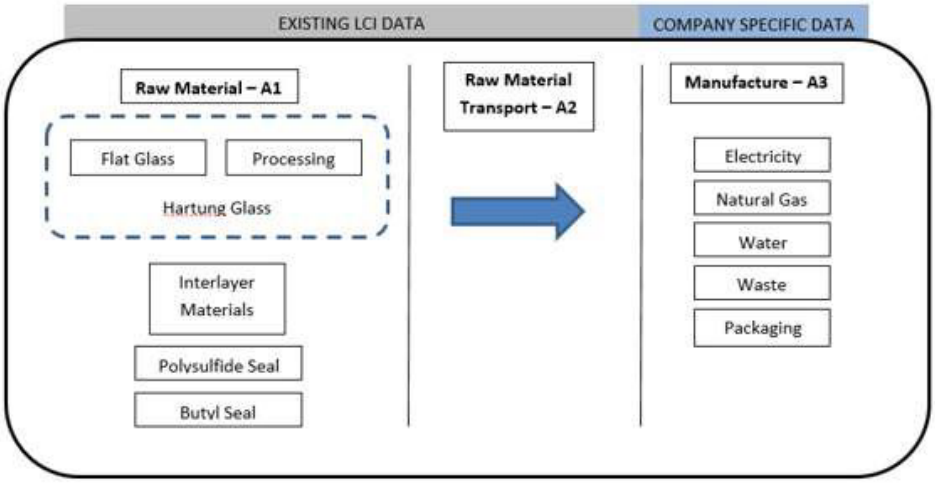

Figure 2: System Boundary Flow Diagram

Description of the System Boundary (X=included in LCA: MND=module not declared)																
Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits & Loads Beyond System Boundaries
Raw Material Supply	Transport	Manufacturing	Transport from the gate to the site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-construction demolition	Transport	Waste Processing	Disposal	Reuse-Recover-Recycling Potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Table 5: System Boundary

Estimates and Assumptions

Estimates and assumptions are required in life cycle analysis to constrain the project boundary or model when little or no data is available. In this study of Contraflam products, estimates or assumptions were made regarding the background dataset for some of the raw material inputs as specific datasets were not available in the software. Estimates were also used for transportation distances when actual distances were not available. All estimates and assumptions are appropriately noted in the report.

Cut-Off Criteria

The cut-off criteria established for the study include materials, energy, and emissions data. For the purposes of this study, the criteria are as follows:

- Mass – Chemicals with a combined weight less than 1% of the mass of the modeled product may be excluded, providing its environmental relevance is not a concern.
- Human activity factors were not included in the scope of this study.
- Capital equipment factors were not included in the scope of this study.

Background Data

GaBi version 10.0 software system was used for modeling the life cycle of the Contraflam products. Each background dataset was taken from the GaBi Thinkstep US Ecoinvent, USLCI databases, or Ecoinvent v3.

Data Quality

Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty. The data sources used are complete and representative of North America and Europe (depending on the material source) in terms of the geographic and technological coverage and are less than 10 years old. Any deviations from these initial data quality requirements for secondary data are documented in the report. Overall, the primary data from the manufacturing location is of very high quality, being directly tracked and measured by facility personnel. Secondary data sets are of fair-to-good quality.

Period Under Review

Data for this LCA was collected for the 2019 calendar year.

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Contraflam® Product Family

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Allocation

Auburn is the only facility for Saint-Gobain Vetrotech that manufactures the Contraflam products; although the Contraflam is not the only product manufactured at Auburn. Allocation to the Contraflam product line at Auburn was based on production data provided by the manufacturing personnel. Contraflam is produced for various fire ratings, such as 60, 90, and 120. In order to accurately allocate inputs and outputs, a full list of all Contraflam orders produced in 2019 was evaluated. Production was allocated among the Contraflam products based on the square meters produced as a percentage of the overall Contraflam production.

Comparability

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. 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, which is not permitted under this PCR. However, variation and deviations are possible.

LCA Results

The results shown here are representative of the embodied environmental impacts for 1 square meter of the weighted average Contraflam product. The tables and charts below present the environmental impact potentials for the system boundary modules A1-A3, raw material supply, raw material transport, and manufacturing as specified by the PCR. The results for each of the individual products represented in this EPD are shown in the Appendix.

Environmental Impacts – North America

TRACI Impact Assessment Method (North America)					
Impact Indicator	**Unit**	**Raw Materials (A1)**	**Raw Material Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
Global Warming Potential	*kg CO_2 eq*	7.24E+01	3.14E+01	1.67E+01	1.21E+02
Ozone Depletion Potential	*kg CFC 11 eq*	3.10E-12	2.37E-15	3.00E-11	3.31E-11
Acidification Potential	*kg SO_2 eq*	5.48E-01	1.96E-01	6.41E-02	8.08E-01
Eutrophication Potential	*kg N eq*	2.28E-02	9.64E-03	4.32E-03	3.68E-02
Photochemical Ozone Creation Potential	*kg O_3 eq*	6.62E+00	5.07E+00	1.18E+00	1.29E+01
Abiotic Resource Depletion Potential (elements)	*kg Fe eq*	1.94E+00	5.48E-02	2.41E-01	2.23E+00
Abiotic Resource Depletion Potential (fossil fuels)	*MJ*	1.26E+02	5.97E+01	7.13E+01	2.58E+02

Table 6: Contraflam Weighted Average Results for North America, TRACI 2.1 Environmental Impacts

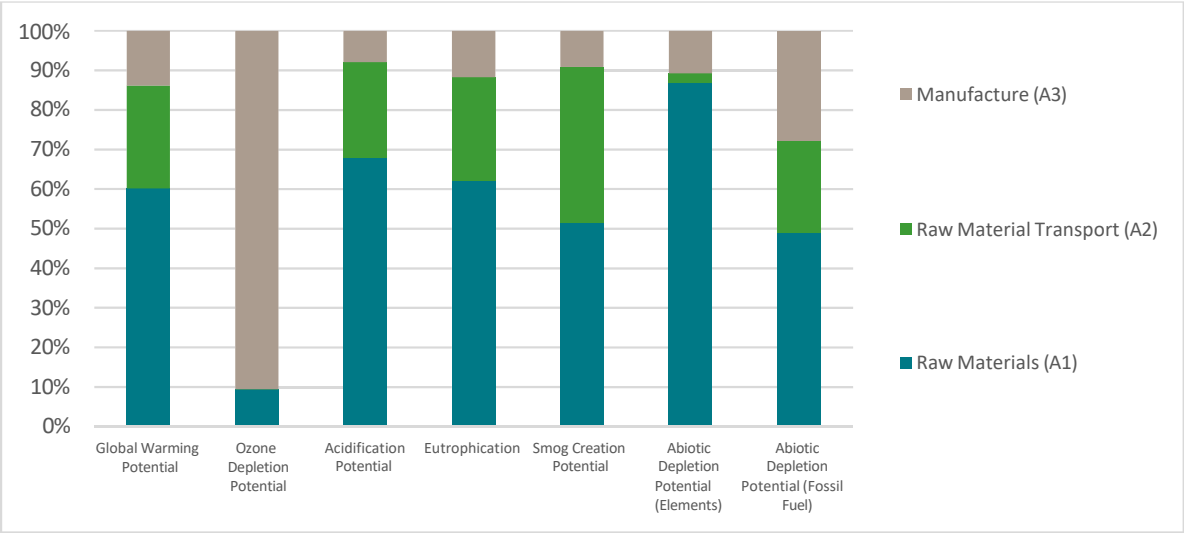

Figure 3: Contraflam Weighted Average Results for North America, TRACI 2.1 Environmental Impacts

Environmental Impacts – Europe

CML Impact Assessment Method (Europe)					
Impact Indicator	**Unit**	**Raw Materials (A1)**	**Raw Material Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
Global Warming Potential	*kg CO_2 eq*	7.28E+01	3.14E+01	1.70E+01	1.21E+02
Ozone Depletion Potential	*kg CFC 11 eq*	2.93E-12	2.37E-15	2.89E-11	3.18E-11
Acidification Potential	*kg SO_2 eq*	5.14E-01	1.65E-01	5.91E-02	7.38E-01
Eutrophication Potential	*kg (PO4)3 eq*	5.43E-02	2.98E-02	7.50E-03	9.16E-02
Photochemical Ozone Creation Potential	*kg ethane eq*	-5.78E-02	1.16E-02	5.63E-03	-4.06E-02
Abiotic Resource Depletion Potential (elements)	*kg Sb eq*	1.74E-04	5.18E-06	1.23E-05	1.91E-04
Abiotic Resource Depletion Potential (fossil fuels)	*MJ*	9.79E+02	4.46E+02	5.84E+02	2.01E+03

Table 7: Contraflam Weighted Average Results for Europe, CML Environmental Impacts

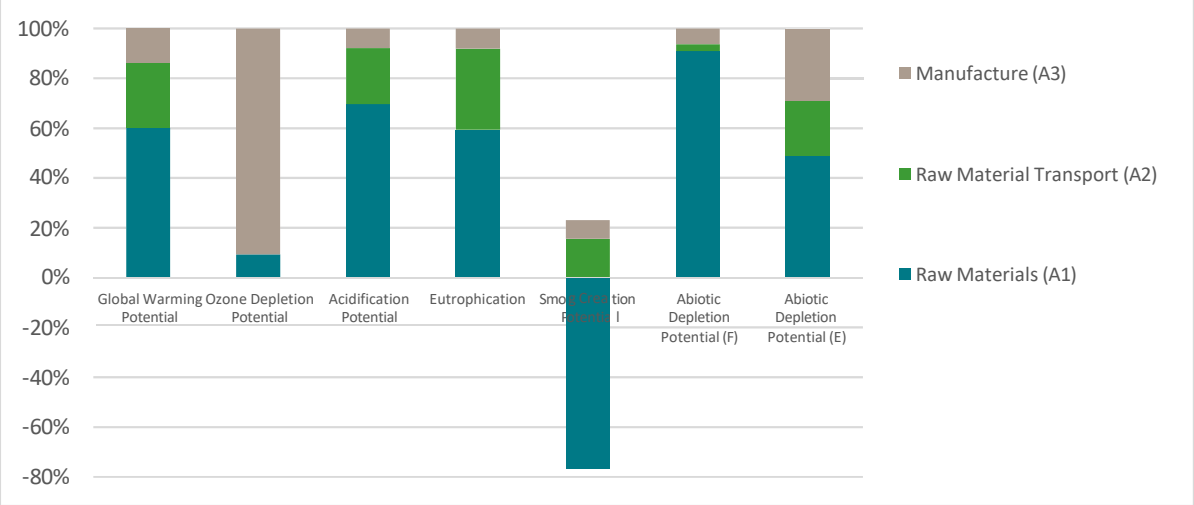

Figure 4: Contraflam Weighted Average Results for Europe, CML Environmental Impacts

Resource Use

Primary Resource Use					
		Raw Materials (A1)	**Raw Materials Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
PERE: Renewable primary energy as energy carrier	MJ	5.90E+01	2.37E+00	1.34E+02	1.96E+02
PERM: Renewable primary energy resources as material utilization	MJ	-2.44E-08	-4.23E-09	1.16E+02	1.16E+02
PERT: Total use of renewable primary energy resources	MJ	5.90E+01	2.37E+00	2.50E+02	3.11E+02
PENRE: Non-renewable primary energy as energy carrier	MJ	1.03E+03	4.47E+02	6.04E+02	2.08E+03
PENRM: Non-renewable primary energy as material utilization	MJ	1.03E-02	8.33E-04	4.96E-03	1.61E-02
PENRT: Total use of non-renewable primary energy resources	MJ	1.03E+03	4.47E+02	6.04E+02	2.08E+03

Table 8: Contraflam Weighted Average Use of Primary Resources

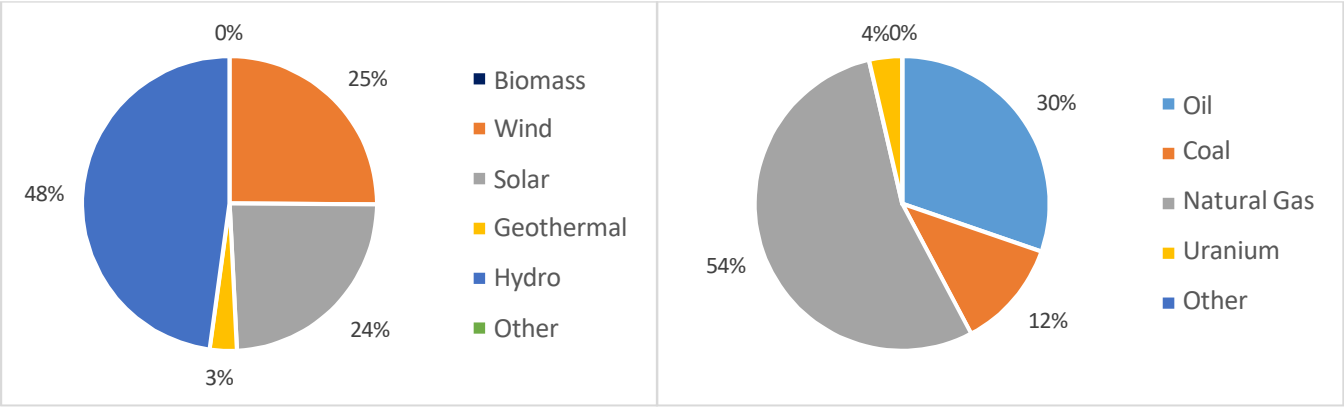

Figure 4: Contraflam Weighted Average Renewable and Non-Renewable Energy by Source

Secondary Resource Use					
		Raw Materials (A1)	**Raw Materials Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
SM: Use of Secondary materials	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF: Use of Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF: Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE: Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW: Use of net fresh water resources	m^3	1.65E-01	8.50E-03	4.74E-01	6.48E-01

Table 9: Contraflam Weighted Average, use of Secondary Resources

Output Flows and Waste Categories

Waste Categories					
		Raw Materials (A1)	**Raw Materials Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
HWD: Hazardous waste disposed	kg	1.82E-03	4.59E-07	3.25E-07	1.82E-03
NHWD: Non-hazardous waste disposed	kg	5.41E+00	1.33E-02	1.21E+01	1.75E+01
RWD: Radioactive waste disposed	kg	2.09E-02	6.31E-04	7.40E-03	2.90E-02
RWD_{High}: High level radioactive waste, conditioned, to final repository	kg	1.88E-05	7.55E-07	8.84E-06	2.84E-05
RWD_{Low}: Intermediate and low level radioactive waste, conditioned, to final repository	kg	6.04E-04	2.05E-05	2.41E-04	8.66E-04

Table 10: Contraflam Weighted Average, Waste Categories

Output Flows					
		Raw Materials (A1)	**Raw Materials Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
CRU: Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR: Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER: Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE: Recovered energy exported	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 11: Contraflam Weighted Average Output Flows

Biogenic Carbon

Biogenic Carbon					
	Raw Materials (A1)	**Raw Materials Transport (A2)**	**Manufacture (A3)**	**Packaging (A3)**	**Cradle-to-Gate (A1-A3)**
Biogenic Carbon (kg CO2 eq)	-1.61E+00	-8.90E-02	-9.93E-01	-1.94E+01	-2.21E+01

Table 12: Contraflam Weighted Average Biogenic Carbon

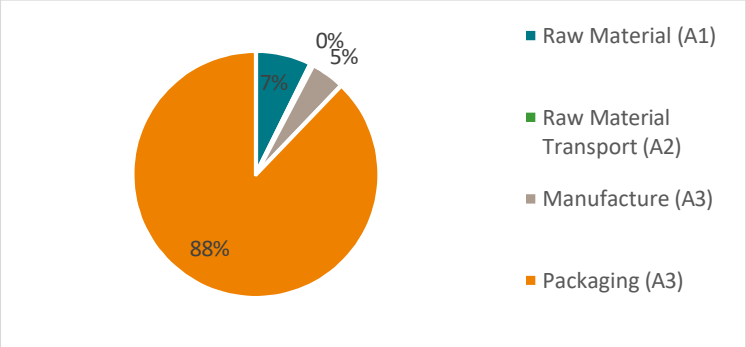

Figure 5: Contraflam Weighted Average Biogenic Carbon

LCA Interpretation

Based on the results from the life cycle assessment, the life cycle impacts are strongly driven by the raw materials, particularly the glass which accounts for as much as 95% of the raw material impacts and 70% of the cradle-to-gate impact potentials. The impacts for the raw material transportation stage (A2) also contribute by as much as 5-40% of the overall environmental impact potentials. Sensitivity analysis completed for the LCA specifically attributes the majority of the raw material transportation impacts to the interlayer transportation.

LCA Development

This EPD and the corresponding LCA were prepared by Saint-Gobain Corporation North America in Malvern, Pennsylvania.

References

- Product Category Rules for Building-Related Product and Services: Part A – Life Cycle Assessment Calculation Rules and Report Requirements, Version 3.2 2018. UL Environment
- UL General Program Rules, Version 2.5, March 2020. UL Environment
- Product Category Rule Guidance for Building-Related Products and Services: Part B – Processed Glass EPD Requirements. Version 1.0 2016. UL Environment
- ISO 14040: 2006 Series – Environmental Management-Life Cycle Assessment
- ISO 14025 – Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 14044 – Environmental management – Life cycle assessment – Requirements and guidelines; Amendment 2: 2020
- EN 15804: 2012+A1: 2013 – Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products
- ISO 21930: 2017 – Sustainability in building construction – Environmental declaration of building products
- Vetrotech Saint-Gobain Contraflam Life Cycle Assessment Report, March 2021. Saint-Gobain North America EHS&S Department
- Vetrotech Website: www.vetrotech.com

Appendix: Individual Product Results for Contraflam Products

Vetrotech Contraflam 60					
Cradle-to-Gate		**Raw Materials (A1)**	**Raw Materials Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
TRACI 2.1 Impact Categories					
Global Warming Potential	kg CO^2 eq	5.71E+01	2.73E+01	1.56E+01	9.99E+01
Ozone Depletion Potential	kg CFC-11 eq	2.41E-12	2.06E-15	3.00E-11	3.24E-11
Acidification Potential	kg SO_2 eq	4.28E-01	1.71E-01	6.18E-02	6.61E-01
Eutrophication Potential	kg N eq	1.78E-02	8.39E-03	4.14E-03	3.04E-02
Smog Creation Potential	kg O3 eq	5.19E+00	4.43E+00	1.14E+00	1.08E+01
Abiotic Depletion Potential (elements)	kg Fe eq	1.51E+00	4.77E-02	2.31E-01	1.79E+00
Abiotic Depletion Potential (fossil)	MJ	1.00E+02	5.20E+01	7.00E+01	2.22E+02
CML Impact Categories					
Global Warming Potential	kg CO^2 eq	5.74E+01	2.73E+01	1.58E+01	1.01E+02
Ozone Depletion Potential	kg R-11 eq	2.27E-12	2.06E-15	2.89E-11	3.11E-11
Acidification Potential	kg SO_2 eq	4.01E-01	1.44E-01	5.70E-02	6.02E-01
Eutrophication Potential	kg phosphate eq	4.25E-02	2.60E-02	7.22E-03	7.57E-02
Smog Creation Potential	kg ethane eq	-4.49E-02	1.02E-02	5.51E-03	-2.92E-02
Abiotic Depletion Potential (elements)	kg Sb eq	1.36E-04	4.51E-06	1.19E-05	1.52E-04
Abiotic Depletion Potential (fossil)	MJ	7.76E+02	3.88E+02	5.68E+02	1.73E+03
Use of Primary Resources					
Renewable primary energy as energy carrier	MJ	4.68E+01	2.00E+00	1.25E+02	1.73E+02
Renewable primary energy resources as material utilization	MJ	-1.95E-08	-3.58E-09	1.16E+02	1.16E+02
Total use of renewable primary energy resources	MJ	4.68E+01	2.00E+00	2.40E+02	2.89E+02
Non-renewable primary energy as energy carrier	MJ	8.18E+02	3.90E+02	5.87E+02	1.79E+03
Non-renewable primary energy as material utilization	MJ	8.13E-03	6.76E-04	4.60E-03	1.34E-02
Total use of non-renewable primary energy resources	MJ	8.18E+02	3.90E+02	5.87E+02	1.79E+03
Use of Secondary Resources					
Use of Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water resources	m^3	1.32E-01	7.14E-03	4.41E-01	5.80E-01
Waste Flows					
Hazardous waste disposed	kg	1.41E-03	3.74E-07	3.03E-07	1.41E-03
Non-hazardous waste disposed	kg	4.26E+00	1.15E-02	9.71E+00	1.40E+01
Radioactive waste disposed	kg	1.67E-02	5.48E-04	6.87E-03	2.41E-02
High level radioactive waste to final repository	kg	1.51E-05	6.56E-07	8.21E-06	2.40E-05
Intermediate and low level radioactive waste	kg	4.84E-04	1.78E-05	2.24E-04	7.26E-04
Output Material Flows					
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon					
Biogenic Carbon	kg CO2 eq	-1.27E+00	-7.32E-02	-9.18E-01	-1.94E+01

Table 13: Contraflam 60 Individual Results

Vetrotech Contraflam Structure 60					
Cradle-to-Gate		**Raw Materials (A1)**	**Raw Materials Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
TRACI 2.1 Impact Categories					
Global Warming Potential	kg CO^2 eq	8.00E+01	1.55E+01	1.76E+01	1.13E+02
Ozone Depletion Potential	kg CFC-11 eq	2.88E-12	1.21E-15	3.00E-11	3.29E-11
Acidification Potential	kg SO_2 eq	6.40E-01	9.43E-02	6.56E-02	8.00E-01
Eutrophication Potential	kg N eq	2.63E-02	4.81E-03	4.44E-03	3.56E-02
Smog Creation Potential	kg O3 eq	7.61E+00	2.43E+00	1.20E+00	1.12E+01
Abiotic Depletion Potential (elements)	kg Fe eq	2.25E+00	2.72E-02	2.47E-01	2.53E+00
Abiotic Depletion Potential (fossil)	MJ	1.34E+02	2.95E+01	7.23E+01	2.36E+02
CML Impact Categories					
Global Warming Potential	kg CO^2 eq	8.04E+01	1.55E+01	1.79E+01	1.14E+02
Ozone Depletion Potential	kg R-11 eq	2.73E-12	1.21E-15	2.89E-11	3.16E-11
Acidification Potential	kg SO_2 eq	6.00E-01	7.93E-02	6.04E-02	7.40E-01
Eutrophication Potential	kg phosphate eq	6.29E-02	1.45E-02	7.67E-03	8.51E-02
Smog Creation Potential	kg ethane eq	-6.94E-02	4.73E-03	5.73E-03	-5.89E-02
Abiotic Depletion Potential (elements)	kg Sb eq	2.02E-04	2.58E-06	1.25E-05	2.17E-04
Abiotic Depletion Potential (fossil)	MJ	1.04E+03	2.20E+02	5.96E+02	1.85E+03
Use of Primary Resources					
Renewable primary energy as energy carrier	MJ	6.40E+01	1.61E+00	1.42E+02	2.08E+02
Renewable primary energy resources as material utilization	MJ	-2.40E-08	-2.90E-09	1.16E+02	1.16E+02
Total use of renewable primary energy resources	MJ	6.40E+01	1.61E+00	2.58E+02	3.23E+02
Non-renewable primary energy as energy carrier	MJ	1.09E+03	2.21E+02	6.17E+02	1.93E+03
Non-renewable primary energy as material utilization	MJ	1.16E-02	7.78E-04	5.23E-03	1.76E-02
Total use of non-renewable primary energy resources	MJ	1.09E+03	2.21E+02	6.17E+02	1.93E+03
Use of Secondary Resources					
Use of Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water resources	m^3	1.63E-01	6.20E-03	5.02E-01	6.70E-01
Waste Flows					
Hazardous waste disposed	kg	1.67E-03	4.17E-07	3.32E-07	1.67E-03
Non-hazardous waste disposed	kg	6.10E+00	7.06E-03	1.22E+01	1.83E+01
Radioactive waste disposed	kg	2.16E-02	3.22E-04	7.83E-03	2.97E-02
High level radioactive waste to final repository	kg	1.84E-05	3.86E-07	9.36E-06	2.81E-05
Intermediate and low level radioactive waste	kg	6.08E-04	1.04E-05	2.56E-04	8.74E-04
Output Material Flows					
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon					
Biogenic Carbon	kg CO2 eq	-1.80E+00	-7.56E-02	-1.05E+00	-1.94E+01

Table 14: Contraflam Structure 60 Individual Results

Vetrotech Contraflam 90					
Cradle-to-Gate		**Raw Materials (A1)**	**Raw Materials Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
TRACI 2.1 Impact Categories					
Global Warming Potential	kg CO^2 eq	7.31E+01	3.01E+01	1.68E+01	1.20E+02
Ozone Depletion Potential	kg CFC-11 eq	2.98E-12	2.27E-15	3.00E-11	3.30E-11
Acidification Potential	kg SO_2 eq	5.57E-01	1.88E-01	6.43E-02	8.09E-01
Eutrophication Potential	kg N eq	2.31E-02	9.24E-03	4.33E-03	3.67E-02
Smog Creation Potential	kg O3 eq	6.71E+00	4.86E+00	1.18E+00	1.27E+01
Abiotic Depletion Potential (elements)	kg Fe eq	1.97E+00	5.26E-02	2.42E-01	2.26E+00
Abiotic Depletion Potential (fossil)	MJ	1.27E+02	5.73E+01	7.14E+01	2.55E+02
CML Impact Categories					
Global Warming Potential	kg CO^2 eq	7.35E+01	3.01E+01	1.71E+01	1.21E+02
Ozone Depletion Potential	kg R-11 eq	2.81E-12	2.27E-15	2.89E-11	3.17E-11
Acidification Potential	kg SO_2 eq	5.22E-01	1.58E-01	5.92E-02	7.39E-01
Eutrophication Potential	kg phosphate eq	5.52E-02	2.85E-02	7.51E-03	9.12E-02
Smog Creation Potential	kg ethane eq	-5.89E-02	1.10E-02	5.64E-03	-4.23E-02
Abiotic Depletion Potential (elements)	kg Sb eq	1.76E-04	4.97E-06	1.23E-05	1.93E-04
Abiotic Depletion Potential (fossil)	MJ	9.82E+02	4.27E+02	5.85E+02	1.99E+03
Use of Primary Resources					
Renewable primary energy as energy carrier	MJ	5.95E+01	2.31E+00	1.35E+02	1.97E+02
Renewable primary energy resources as material utilization	MJ	-2.43E-08	-4.12E-09	1.16E+02	1.16E+02
Total use of renewable primary energy resources	MJ	5.95E+01	2.31E+00	2.50E+02	3.12E+02
Non-renewable primary energy as energy carrier	MJ	1.04E+03	4.29E+02	6.06E+02	2.07E+03
Non-renewable primary energy as material utilization	MJ	1.04E-02	8.29E-04	4.99E-03	1.63E-02
Total use of non-renewable primary energy resources	MJ	1.04E+03	4.29E+02	6.06E+02	2.07E+03
Use of Secondary Resources					
Use of Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water resources	m^3	1.65E-01	8.32E-03	4.77E-01	6.50E-01
Waste Flows					
Hazardous waste disposed	kg	1.74E-03	4.56E-07	3.26E-07	1.74E-03
Non-hazardous waste disposed	kg	5.48E+00	1.28E-02	1.21E+01	1.76E+01
Radioactive waste disposed	kg	2.10E-02	6.06E-04	7.44E-03	2.90E-02
High level radioactive waste to final repository	kg	1.88E-05	7.25E-07	8.89E-06	2.84E-05
Intermediate and low level radioactive waste	kg	6.04E-04	1.97E-05	2.43E-04	8.67E-04
Output Material Flows					
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon					
Biogenic Carbon	kg CO2 eq	-1.63E+00	-8.79E-02	-9.99E-01	-1.94E+01

Table 15: Contraflam 90 Individual Results

Vetrotech Contraflam 120					
Cradle-to-Gate		**Raw Materials (A1)**	**Raw Materials Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
TRACI 2.1 Impact Categories					
Global Warming Potential	kg CO^2 eq	7.47E+01	3.85E+01	1.68E+01	1.30E+02
Ozone Depletion Potential	kg CFC-11 eq	3.02E-12	2.89E-15	3.00E-11	3.30E-11
Acidification Potential	kg SO_2 eq	5.57E-01	2.41E-01	6.44E-02	8.63E-01
Eutrophication Potential	kg N eq	2.33E-02	1.18E-02	4.34E-03	3.94E-02
Smog Creation Potential	kg O3 eq	6.76E+00	6.25E+00	1.18E+00	1.42E+01
Abiotic Depletion Potential (elements)	kg Fe eq	1.97E+00	6.73E-02	2.43E-01	2.28E+00
Abiotic Depletion Potential (fossil)	MJ	1.31E+02	7.34E+01	7.15E+01	2.76E+02
CML Impact Categories					
Global Warming Potential	kg CO^2 eq	7.51E+01	3.86E+01	1.71E+01	1.31E+02
Ozone Depletion Potential	kg R-11 eq	2.86E-12	2.89E-15	2.89E-11	3.17E-11
Acidification Potential	kg SO_2 eq	5.22E-01	2.04E-01	5.93E-02	7.85E-01
Eutrophication Potential	kg phosphate eq	5.54E-02	3.66E-02	7.53E-03	9.96E-02
Smog Creation Potential	kg ethane eq	-5.83E-02	1.45E-02	5.63E-03	-3.82E-02
Abiotic Depletion Potential (elements)	kg Sb eq	1.76E-04	6.36E-06	1.23E-05	1.95E-04
Abiotic Depletion Potential (fossil)	MJ	1.02E+03	5.48E+02	5.85E+02	2.15E+03
Use of Primary Resources					
Renewable primary energy as energy carrier	MJ	6.15E+01	2.77E+00	1.35E+02	1.99E+02
Renewable primary energy resources as material utilization	MJ	-2.59E-08	-4.94E-09	1.16E+02	1.16E+02
Total use of renewable primary energy resources	MJ	6.15E+01	2.77E+00	2.50E+02	3.15E+02
Non-renewable primary energy as energy carrier	MJ	1.07E+03	5.50E+02	6.06E+02	2.23E+03
Non-renewable primary energy as material utilization	MJ	1.06E-02	9.06E-04	4.99E-03	1.65E-02
Total use of non-renewable primary energy resources	MJ	1.07E+03	5.50E+02	6.06E+02	2.23E+03
Use of Secondary Resources					
Use of Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water resources	m^3	1.75E-01	9.81E-03	4.76E-01	6.61E-01
Waste Flows					
Hazardous waste disposed	kg	2.51E-03	6.91E-07	3.90E-07	2.51E-03
Non-hazardous waste disposed	kg	8.94E+00	1.67E-02	1.88E+01	2.78E+01
Radioactive waste disposed	kg	3.31E-02	7.84E-04	9.06E-03	4.30E-02
High level radioactive waste to final repository	kg	2.91E-05	9.38E-07	1.08E-05	4.09E-05
Intermediate and low level radioactive waste	kg	9.46E-04	2.54E-05	2.96E-04	1.27E-03
Output Material Flows					
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon					
Biogenic Carbon	kg CO2 eq	-1.67E+00	-9.92E-02	-1.00E+00	-1.94E+01

Table 16: Contraflam 120 Individual Results

Vetrotech Contraflam Structure 120					
Cradle-to-Gate		**Raw Materials (A1)**	**Raw Materials Transport (A2)**	**Manufacture (A3)**	**Total (A1-A3)**
TRACI 2.1 Impact Categories					
Global Warming Potential	kg CO^2 eq	1.18E+02	3.86E+01	2.04E+01	1.77E+02
Ozone Depletion Potential	kg CFC-11 eq	4.33E-12	2.95E-15	3.00E-11	3.43E-11
Acidification Potential	kg SO_2 eq	9.20E-01	2.40E-01	7.12E-02	1.23E+00
Eutrophication Potential	kg N eq	3.81E-02	1.19E-02	4.88E-03	5.48E-02
Smog Creation Potential	kg O3 eq	1.10E+01	6.20E+00	1.29E+00	1.85E+01
Abiotic Depletion Potential (elements)	kg Fe eq	3.24E+00	6.76E-02	2.71E-01	3.58E+00
Abiotic Depletion Potential (fossil)	MJ	2.01E+02	7.36E+01	7.55E+01	3.51E+02
CML Impact Categories					
Global Warming Potential	kg CO^2 eq	1.19E+02	3.87E+01	2.07E+01	1.78E+02
Ozone Depletion Potential	kg R-11 eq	4.09E-12	2.95E-15	2.89E-11	3.30E-11
Acidification Potential	kg SO_2 eq	8.63E-01	2.02E-01	6.55E-02	1.13E+00
Eutrophication Potential	kg phosphate eq	9.08E-02	3.66E-02	8.34E-03	1.36E-01
Smog Creation Potential	kg ethane eq	-9.84E-02	1.36E-02	5.98E-03	-7.88E-02
Abiotic Depletion Potential (elements)	kg Sb eq	2.90E-04	6.39E-06	1.33E-05	3.10E-04
Abiotic Depletion Potential (fossil)	MJ	1.56E+03	5.49E+02	6.34E+02	2.74E+03
Use of Primary Resources					
Renewable primary energy as energy carrier	MJ	9.57E+01	3.20E+00	1.64E+02	2.63E+02
Renewable primary energy resources as material utilization	MJ	-3.76E-08	-5.74E-09	1.16E+02	1.16E+02
Total use of renewable primary energy resources	MJ	9.57E+01	3.20E+00	2.80E+02	3.79E+02
Non-renewable primary energy as energy carrier	MJ	1.64E+03	5.51E+02	6.59E+02	2.85E+03
Non-renewable primary energy as material utilization	MJ	1.70E-02	1.27E-03	6.10E-03	2.43E-02
Total use of non-renewable primary energy resources	MJ	1.64E+03	5.51E+02	6.59E+02	2.85E+03
Use of Secondary Resources					
Use of Secondary materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of Renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water resources	m^3	2.55E-01	1.18E-02	5.78E-01	8.45E-01
Waste Flows					
Hazardous waste disposed	kg	1.77E-03	5.03E-07	3.30E-07	1.77E-03
Non-hazardous waste disposed	kg	5.58E+00	1.61E-02	1.28E+01	1.84E+01
Radioactive waste disposed	kg	2.21E-02	7.72E-04	7.44E-03	3.03E-02
High level radioactive waste to final repository	kg	2.01E-05	9.24E-07	8.89E-06	3.00E-05
Intermediate and low level radioactive waste	kg	6.42E-04	2.51E-05	2.43E-04	9.09E-04
Output Material Flows					
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic Carbon					
Biogenic Carbon	kg CO2 eq	-2.65E+00	-1.30E-01	-1.23E+00	-1.94E+01

Table 17: Contraflam Structure 120 Individual Results