ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

Programme Operator: The International EPD® system. www.environdec.com

CONTRAFLAM 90

90-4 (5/4/4/4/5) – 90 (5/4/4/5) – 90 (6/5/5/6) – 90-4 (5/5/5/5/5) – 90-4 (6/6/6/6/6) – 90-4 (5/4/4/4/44.2)

EI90 (Insulation): Fire resistant glazing with tested heat insulation of 90 minutes

Date of issue: 2018/12/20
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EPD VERIFIED

EPD®

VERIFICATION
S-P-1094

vetrotech SAINT-GOBAIN

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General information

Manufacturer:

VETROTECH SAINT-GOBAIN INTERNATIONAL AG
Bernstrasse 43
3175 Flamatt
Switzerland

European standard EN 15804 served as core EPD	
Product / product family name and manufacturer represented	CONTRAFLAM 90 produced by VETROTECH SAINT-GOBAIN, with SAINT-GOBAIN GLASS INDUSTRY flat glass
Declaration issued	2018/12/20
valid until[1]	2023/12/20
Program used	INTERNATIONAL EPD SYSTEM www.environdec.com GPI 3.0 EPD International AB Box 210 60, SE-100 31 Stockholm Sweden
EPD registration number/declaration number	S-P-1094
PCR identification	EN 15804 as the core PCR and PCR for construction products and construction services issue by the International EPD System (PCR 2012:01 Construction products and construction services, version 2.1 / 2017-1-4)
PCR review was conducted by	The technical committee of the international EPD system Chair: Massimo Marino Contact via info@environdec.com
CPC Classification	37115 “safety glass”
Independent verification of the declaration and data, according to ISO 14025	An independent verification of the declaration and data was made, according to ISO 14025:2010. This verification was based on the PCR mentioned above. EPD process certification (internal)
Third party verifier	Bureau Veritas Certification Sverige AB for the EPD process certification
Accredited or approved by	INTERNATIONAL EPD SYSTEM Swedac Ackreditering
Procedure for follow up data during EPD validity includes third party	Yes, EPD process certification.

Reading note: In this document, the thousand separator and the decimal mark follow the International System English version, *i.e* 1 234.56

[1] And EPD should provide current information and maybe updated if conditions change. The stated validity is, therefore, subject to the continued registration and publication at www.environdec.com .

Product description

Product description and description of use

CONTRAFLAM 90 is a monolithic fire resistant glass with EI90 heat insulation properties according to European standard EN 13501-2. It consists of two or more sheets of toughened safety glass. The cavity between the sheets of glass is filled with a transparent intumescent interlayer. This enables the glass to react when exposed to radiant heat and fire in order to protect life and property in living places for the specific time frame. Additionally, there is the option to add fall-out protection in the event of breakage by adding a PVB layer to create a laminated glazing to resist greater penetration.

In this Environmental Product Declaration, one m^2 of 5 different glazing configurations will be analyzed:

1. CONTRAFLAM 90-4 (5/4/4/4/5)
2. CONTRAFLAM 90 (5/4/4/5)
3. CONTRAFLAM 90 (6/5/5/6)
4. CONTRAFLAM 90-4 (5/5/5/5/5)
5. CONTRAFLAM 90-4 (6/6/6/6/6)
6. CONTRAFLAM 90-4 STADIP (5/4/4/4/44.2)

Performance data

The range of CONTRAFLAM 90 is very large and can consist of various additional layers and materials, depending on the coating, the glass thickness and the number of chambers. Here are a few examples of configurations for each of the products described in this EPD.

Discover more information about the CONTRAFLAM range on www.vetrotech.com.

	N° 1	N° 2	N° 3	N° 4	N° 5	N° 6
	CONTRAFLAM 90-4 (5/4/4/4/5)	**CONTRAFLAM 90 (5/4/4/5)**	**CONTRAFLAM 90 (6/5/5/6)**	**CONTRAFLAM 90-4 (5/5/5/5/5)**	**CONTRAFLAM 90-4 (6/6/6/6/6)**	**CONTRAFLAM 90-4 STADIP (5/4/4/4/44.2)**
Details for this specific calculation -	-	-	-	-	-	-
Mechanical properties						
Nominal thickness (mm)	40	36	40	43	48	44
Weight (kg/m^2)	82	72	82	90	102	90
Visible parameters						
Light transmittance (LT) %	81	83	82	80	79	80
External light reflection (RLE) (%)	10 / 10	10 / 10	10 / 10	10 / 10	10 / 10	10 / 10
Thermal properties						
Energy transmittance (ET) %	56	59	56	55	52	51
Energy absorbance (EA) %	8 / 8	8 / 8	8 / 8	8 / 8	8 / 8	8 / 8
Solar factor g	0,64	0,66	0,65	0,63	0,62	0,61
Safety properties						
Class EN 356 (protection against vandalism and burglary)	P1A	P1A	P1A	P1A	P1A	P2A
Acoustics properties						
Rw(C;Ctr) (real test)	45 (-2; -3)	46 (-2; -3)	NPD	NPD	NPD	47 (-1; -3)

The performance data are given according to the EN 410-2011 standard for thermal and visible parameters and following the EN 12758 for the acoustic data. Fire performance data is determined according to EN13823, EN1363-1, EN1363-2 and associated test standards. Fire classification is following EN15998, EN13501-1 and EN13501-2.

Declaration of the main product components and/or materials

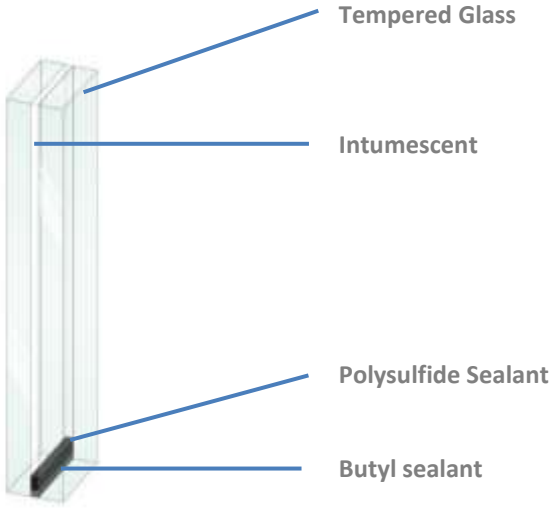


Illustration shows a CONTRAFLAM 90 without laminated glass

	N° 1 CONTRAFLAM 90-4 (5/4/4/4/5)	N° CONTRAFLAM 90-4 STADIP (5/4/4/4/44.2)	
	Weight (in %)	Weight (in %)	CAS number
Glass	67	69	CAS number 65997-17-3, EINECS number 266-46-
Fire resistant Interlayer	32	29	n/a
Sealant (polysulfide)	< 1	< 1	Polymer
Butyl sealant	< 1	< 1	Polymer
PVB interlayer	0	0.92	CAS number 63148-65-2 EINECS number 272-808-3

The above list gives the main components of the product, including those contributing to more than 5% of any environmental impact, if any. The percentages are given for the glass make-ups mentioned in this EPD; the % may vary depending on the glazing configuration.

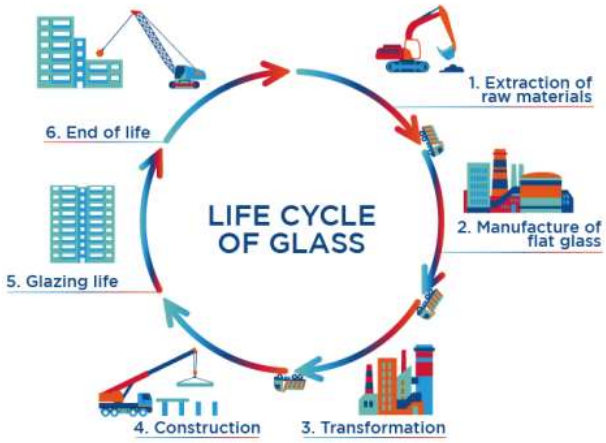
LCA calculation information

FUNCTIONAL UNIT / DECLARED UNIT	1m^2 of CONTRAFLAM EI90 to be incorporated into a building. The impacts of installation are not taken into account.
SYSTEM BOUNDARIES	Cradle to gate: Mandatory Stages = A1-A3
REFERENCE SERVICE LIFE (RSL)	n/a. Boundaries are cradle to gate
CUT-OFF RULES	All significant parameters shall be included. According to EN 15804, mass flows under 1% of the total mass input; and/or energy flows representing less than 1% of the total primary energy usage of the associated unit process may be omitted. However, the total amount of energy and mass omitted must not exceed 5% per module. Substances of Very High Concern (SVHC), as defined in the REACH Regulation (article 57), in a concentration above 0.1% by weight, in glass final products, shall be included in the Life Cycle Inventory and the cut-off rules shall not apply.
ALLOCATIONS	Allocations are done on mass basis (kg)
GEOGRAPHICAL COVERAGE AND TIME PERIOD	The information was established over the year 2014. The information collected comes from the European sites producing float glass and laminated glass (SAINT-GOBAIN GLASS INDUSTRY) and the processor sites from VETROTECH SAINT-GOBAIN.
BACKGROUND DATA SOURCE	GaBi data were used to evaluate the environmental impacts.
SOFTWARE	Gabi 6 - GaBi envision SGG_EPD tool for Building glass 1m2_2016-11-23.gmbx

According to EN 15804, EPD of construction products may not be comparable if they do not comply with this standard. According to ISO 21930, EPD might not be comparable if they are from different programmes.
The EPD owner has the sole ownership, liability and responsibility for the EPD

Life cycle stages

Diagram of the Life Cycle



Relevant stages: as this is a cradle to gate the only relevant stages are A1-A3.

Product stage, A1-A3

Description of the stage: For CONTRAFLAM 90, A1 to A3 represents the production of glass in the float, the transportation to the processing site, and the processing into fire resistant glass.

The product stage includes the extraction and processing of raw materials and energies, transport to the manufacturer, manufacturing and processing of flat glass.

Contraflam manufacturing process flow diagram

1. **RECEPTION AND STORAGE**: Sheets of glass arrive from float glass plants by special transport inloaders and are stored in our plants.
2. **CUTTING**: The right sheet of glass is automatically taken from the glass storage and cut-to-size according the customer's requirements (cut to order).
3. **EDGE TREATMENT**: Glass edges are treated to the prescribed quality to prepare the next processing step.
4. **TEMPERING**: In general, all glasses are tempered to ensure the overall performance in terms of break resistance and accidental impact safety aspects. Of course we can supply every protective glass demanded within our product make-up.
5. **INSULATING GLASS UNIT (IGU) ASSEMBLY**: On a specially designed IGU processing-line, two pieces of glass are assembled together to create an inner chamber, made air and moisture tight by a primary and secondary sealant for maximum durability.
6. **INJECTION OF INTERLAYER**: The chamber is then filled in with an intumescent interlayer and filling holes are sealed.
7. **CURING OF INTERLAYER**: The injected interlayer is cured in a thermal treatment process to achieve transparency and hardness.
8. **QUALITY CONTROL**: All glass units are inspected and checked to regulatory requirements and quality standards before being packed on stillages. That gives us the possibility to meet 100% of customer needs.
9. **STORAGE AND TRANSPORT**: All glass units are packed on stillages and dispatched to the final place of application.

Use of sustainable light bulbs, recycling of broken glass culets, recycling of cardboard, metal, timber and installation of pollution abatement systems and closed circuit management of water: every measure is taken to limit the consumption of energy, extraction of natural resources, production of waste and emissions into the atmosphere.

LCA results

The table below present the environmental impacts associated with the production of 1 square meter of CONTRAFLAM 90. This is a Cradle-to-Gate EPD. The environmental impacts of all the other stages in the life cycle of CONTRAFLAM 90 are not declared (INA).

CONTRAFLAM MEGA 90-4 (5/4/4/4/5)

ENVIRONMENTAL IMPACTS CONTRAFLAM 90-4 (5/4/4/4/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.66E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	1.47E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	5.56E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.47E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	4.46E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	7.45E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	1.95E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM MEGA 90-4 (5/4/4/4/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.53E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.53E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	2.32E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	2.32E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	6.31	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	7.50E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM 90-4 (5/4/4/4/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	1.34E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.58E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	1.48E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM 90-4 (5/4/4/4/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.75	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	INA0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS CONTRAFLAM 90 (5/4/4/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.47E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	1.47E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	4.76E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.24E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	3.90E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	6.44E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	1.74E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM 90 (5/4/4/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.28E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.28E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	2.09E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	2.09E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	5.16	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	6.55E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM 90 (5/4/4/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	1.34E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.42E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	1.36E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM 90 (5/4/4/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.43	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS CONTRAFLAM 90 (6/5/5/6)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.60E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	1.47E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	5.45E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.44E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	4.35E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	7.44E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	1.91E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM 90 (6/5/5/6)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.34E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.34E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	2.25E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	2.25E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	6.31	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	6.90E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM 90 (6/5/5/6)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	1.34E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.45E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	1.38E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM 90 (6/5/5/6)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.75	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS CONTRAFLAM 90-4 (5/5/5/5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.76E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	1.47E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	6.07E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.63E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	4.79E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	8.20E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	2.07E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM 90-4 (5/5/5/5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.58E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.58E+2	2.3E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	2.45E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	2.45E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	7.17	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	7.76E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM 90-4 (5/5/5/5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	1.34E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.61E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	1.49E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM 90-4 (5/5/5/5/5)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.99	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS CONTRAFLAM 90-4 (6/6/6/6/6)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.93E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	1.47E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	6.93E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.89E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	5.35E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	9.45E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	2.27E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM 90-4 (6/6/6/6/6)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.66E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.66E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	2.66E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	2.66E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	8.60	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	8.20E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM 90-4 (6/6/6/6/6)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	1.34E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.65E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	1.52E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM 90-4 (6/6/6/6/6)															
Parameters	**Product stage**	**Construction process stage**		**Use stage**							**End-of-life stage**				**D Reuse. recovery. recycling**
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	2.39	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS CONTRAFLAM 90-4 (6/5/5/5/6)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.83E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	1.47E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	6.41E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.73E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	5.02E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	8.70E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	2.15E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM 90-4 (6/5/5/5/6)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.61E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.61E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	2.53E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	2.53E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	7.74	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	7.94E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM 90-4 (6/5/5/5/6)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	1.34E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.62E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	1.50E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM 90-4 (6/5/5/5/6)															
Parameters	**Product stage**	**Construction process stage**		**Use stage**							**End-of-life stage**				**D Reuse. recovery. recycling**
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	2.15	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

CONTRAFLAM 90-4 STADIP (5/4/4/4/44.2)

ENVIRONMENTAL IMPACTS CONTRAFLAM 90-4 (5/4/4/4/44.2)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	1.75E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas. carbon dioxide. which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	1.47E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons). Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	5.92E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production. heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	1.57E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients. and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	4.77E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil ressources (ADP-elements) - *kg Sb equiv/FU*	7.96E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil ressources (ADP-fossil fuels) - *MJ/FU*	2.12E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources. thereby lowering their availability for future generations.														

RESOURCE USE CONTRAFLAM 90-4 (5/4/4/4/44.2)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.57E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.57E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials - *MJ/FU*	2.48E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	2.48E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	6.87	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	7.59E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES CONTRAFLAM 90-4 (5/4/4/4/44.2)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Hazardous waste disposed *kg/FU*	1.34E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.48E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	1.46E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS CONTRAFLAM 90-4 (5/4/4/4/44.2)

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				D Reuse. recovery. recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	
Components for re-use *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	2.71	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

LCA results interpretation

CONTRAFLAM 90 is made with tempered glasses and intumescent interlayer.
Most of CO_2 emissions are linked to the glass production phase, and the integration of the intumescent interlayer in the glazing.

Water consumption is linked to the electrical energy used for transformation process of the glass, and to the production of the intumescent interlayer.

		Environmental impacts (A1-A3) CONTRAFLAM 90-4 (5/4/4/4/5)	Unit
	Global warming	1.65E+2	kg CO_2 eq./FU
	Non-Renewable resources consumption[1]	1.95E+3	MJ/FU
	Energy consumption[2]	2.57E+3	MJ/FU
	Water consumption[3]	7.50E-1	m^3/FU
	Waste production[4]	1.59E+1	kg/FU

[1]: This indicator corresponds to the abiotic depletion potential of fossil resources.
[2]: This indicator corresponds to the total use of primary energy (renewable and non-renewable)
[3]: This indicator corresponds to the use of fresh net water.
[4]: This indicator corresponds to the sum of hazardous. non-hazardous and radioactive waste disposed.

Health characteristics

Indoor air quality

Clear flat glass is an inert material that doesn't release any inorganic & organic compounds - in particular, no VOC (volatile organic compounds).

The sealant of CONTRAFLAM 90 is made of organic materials which have been tested regarding their VOC emissions (following ISO 16000 standard):

- Polysulfide: total VOC after 28 days < 38 µg/m3 (Eurofins report G07104)
- Polyurethane: total VOC after 28 days < 4 µg /m3 (Eurofins report G08363).

If the glass is laminated, a PVB layer is included in the glazing. The VOC emissions test (following ISO 16000 standard) rank the PVB A+ (highest rank) following the French regulation (Eurofins report G10504).

- Total VOC after 28 days < 200 µg/m^3
- Formaldehyde after 28 days < 10 µg/m^3

Additional Environmental Information

Disposal considerations

Disposal may be in accordance with local and national legal requirements for the disposal of glass waste. The local regulations for discharging waste water in landfills and sewage treatment plants must be taken into consideration for water-soluble material. In the EU, waste code 200102 is applied (Test report 66988008 Eurofins).

Saint-Gobain's environmental policy

Saint-Gobain's environmental vision is to ensure the sustainable development of its Activities, while preserving the environment from the impacts of its processes and services throughout their life cycle. The Group thus seeks to ensure the preservation of resources, meet the expectations of its relevant stakeholders, and offer its customers the highest added value with the lowest environmental impact.

The Group has set two long-term objectives: zero environmental accidents and a minimum impact of its activities on the environment. Short and medium-term goals are set to address these two ambitions. They concern five environmental areas identified by the Group: raw materials and waste; energy, atmospheric emissions and climate; water; biodiversity; and environmental accidents and nuisance.

Saint-Gobain's long term objectives:

	Non recovered waste (2010-2025): -50% Long-term: zero non-recovered waste
	Energy consumption: -15% (2010-2025) CO_2 emissions: -20% (2010-2025) Emissions of NOx. SO_2 and dust: -20% for each emissions category (2010-2025)
	Water discharge: -80% (2010-2025) Long-term: zero industrial water discharge in liquid form
	2025: promote the preservation of natural areas at Company sites as much as possible
	2025: all environmental events are recorded. registered and investigated

More information on our website: www.saint-gobain.com and our Registration Document.

Our products' contribution to Sustainable Buildings

Saint-Gobain encourages sustainable construction and develops innovative solutions for new and renovated buildings that are energy efficient, comfortable, healthy and esthetically superior, while at the same time protecting natural resources.

The following information might be of help for green building certification programs:

RECYCLED CONTENT

(Required for LEED v4 Building product disclosure and optimization - sourcing of raw materials)

Recycled content: proportion (by mass) of recycled material in a product or packaging. Only pre-consumer and post-consumer materials shall be considered as recycled content.

- Post-consumer material: material generated by households or commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose.

  In practice, in the case of flat glass, all material coming from glass recycling collection schemes falls under this category, i.e. glass waste from end-of-life vehicles, construction and demolition waste, etc.

- Pre-consumer material: material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

  In the case of flat glass, this waste originates from the processing or re-processing of glass that takes place before the final product reaches the consumer market. Pre-consumer waste flat glass is made of cut-off, losses during laminating, bending and other processing, including the manufacture of insulating glass units or automotive windscreens.

Cullet generated in the furnace plant and which is reintroduced into the furnace cannot be considered as pre-consumer recycled content, since there was never intent to discard it and therefore it would never have entered the solid waste stream.

Pre-consumer cullet	~7%
Post-consumer cullet	< 1%

In the future, Saint-Gobain Glass intends to continue the increase of recycled material in its products, especially when recycling building post-consumer cullet glass dismantling and recycling networks will be available in every country.

RESPONSIBLE SOURCING

(Required for BREEAM International new construction 2013 – MAT 03 Responsible sourcing)

Romont (Switzerland) and Namyslow (Poland) Vetrotech Saint-Gobain factories are certified ISO 14001. Kinon Aachen (Germany) is also certified ISO 50001 (Energy management).

All Saint-Gobain Glass Industry sites with a glassmaking furnace, are ISO 14001 certified.

All internal Saint-Gobain Glass quarries are certified ISO 14001 like for example SAINT-GOBAIN SAMIN (sand) in France. Many Saint-Gobain Glass raw material suppliers are certified ISO 14001. Our policy consists in encouraging the sourcing of raw materials extracted or made in sites certified ISO 14001 (or the equivalent).

References

EN 15804 + A1(2013) – Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction product.
PCR - PCR 2012:01 Construction products and construction services, version 2.1 / 2017-1-4
GPI 3.0 - GENERAL PROGRAMME INSTRUCTIONS FOR THE INTERNATIONAL EPD® SYSTEM
EN 410-2011 - Glass in building - Determination of luminous and solar characteristics of glazing
EN 12758 - Glazing and airborne sound insulation - Product descriptions and determination of properties
EN13823 - Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item (includes Amendment A1:2014)
EN1363-1 - Fire resistance tests - Part 1: General Requirements
EN1363-2 - Fire resistance tests - Part 2: Alternative and additional procedures
EN15998 - Glass in building - Safety in case of fire, fire resistance - Glass testing methodology for the purpose of classification
EN13501-1 - Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests (includes Amendments A1:2009)
EN13501-2 - Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services