epd-norge
Global program operatør

Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

Toughened Laminated Glass - 44.2

The Norwegian EPD Foundation

Owner of the declaration:
Glaseksperten A/S

Product:
Toughened Laminated Glass - 44.2

Declared unit:
1 m2

This declaration is based on Product Category Rules:
CEN Standard EN 15804:2012+A2:2019 serves as core PCR
NS-EN 17074 Glass in building PCR

Program operator:
The Norwegian EPD Foundation

Declaration number:

NEPD-8464-8130-EN

Registration number:

NEPD-8464-8130-EN

Issue date: 12.12.2024

Valid to: 12.12.2029

EPD software:
LCAno EPD generator ID: 704148

General information

Product

Toughened Laminated Glass - 44.2

Owner of the declaration:

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Program operator:

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Manufacturer:

Glaseksperten A/S

Declaration number:

NEPD-8464-8130-EN

Place of production:

Glaseksperten A/S
Sprogøvej 13
9800 Hjørring, Denmark

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR
NS-EN 17074 Glass in building PCR

Management system:

Statement of liability:

The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Organisation no:

918946411

Declared unit:

1 m2 Toughened Laminated Glass - 44.2

Issue date:

12.12.2024

Declared unit with option:

A1-A3,A4,A5,C1,C2,C3,C4,D

Valid to:

12.12.2029

Year of study:

2023

Functional unit:

Comparability:

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

General information on verification of EPD from EPD tools:

Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Verification of each EPD is made according to EPD-Norway's guidelines for verification and approval requiring that tools are i) integrated into the company's environmental management system, ii) the procedures for use of the EPD tool are approved by EPD-Norway, and iii) the process is reviewed annually by an independent third party verifier. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools

Development and verification of EPD:

The declaration is created using EPD tool lca.tools ver EPD2022.03, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD Norway. NEPDT93

Developer of EPD: Mikkel Holm Larsen

Reviewer of company-specific input data and EPD: Louise Jepsen

Verification of EPD tool:

Independent third party verification of the EPD tool, background data and test-EPD in accordance with EPDNorway's procedures and guidelines for verification and approval of EPD tools.

Third party verifier:

Elisabet Amat, GREENIZE projects

(no signature required)

Approved:

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:

Toughened Laminated Glass; 1m² of 44.2 edge-processed, thermally toughened glass laminated with PVB film. Toughened Laminated Glass is used in applications requiring personal safety, such as exterior and interior glass railings, glass doors, glass panels, and free-standing glass walls. 44.2 refers to two layers of 4mm thermally toughened glass with 0.76mm PVB interlayers, resulting in a total thickness of 8.76mm for the finished glass.

Product specification

44.2 Toughened Laminated Glass with PVB film.

Materials	kg	%
Glass	20,00	96,11
Plastic - Polyvinyl butyral (PVB)	0,81	3,89
Total	20,81	100,00

Packaging	kg	%
Packaging - Wood	0,60	100,00
Total incl. packaging	21,41	100,00

Technical data:

Complies with the requirements of DS-EN 12150-1:2015 Glass in building. Thermally toughened soda lime silicate safety glass - Part 1. DS-EN 14449:2005 Bygningsglas - Lamineret glas og lamineret sikkerhedsglas.
DS-EN 12600:2003 Glass in building. Pendulum test - Impact test method for float glass.

Market:

Scandinavia and the UK

Reference service life, product

The reference service life of this product is 40 years.

Reference service life, building or construction works

The approximate lifespan of a building is 50 years.

LCA: Calculation rules

Declared unit:

1 m2 Toughened Laminated Glass - 44.2

Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

Data quality:

Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases. The data quality of the raw materials in A1 is presented in the table below.

Materials	Source	Data quality	Year
Glass	EPD-GLS-20230184-IBB2-DE	EPD	2021
Packaging - Wood	ecoinvent 3.6	Database	2019
Plastic - Polyvinyl butyral (PVB)	EPD-KUR-20230072-CCI1-EN	EPD	2022

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

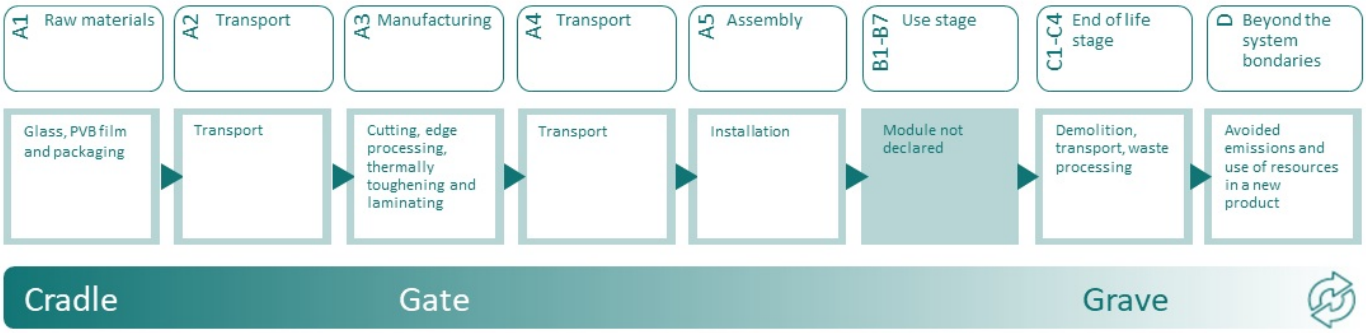
Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

System boundary:

Modules A1-A5 are included in the analysis. It includes the extraction and production of raw materials, transportation to the factory, the production process itself and transportation and assembly.

C1-C4 are included in the analysis. It includes the end of life stage.

Section D is also included it describes the Reuse-Recovery-Recycling-potential.



Additional technical information:

Visit our website for detailed product information, technical documentation, and support.
An operation and maintenance guide is available, outlining proper handling and care for the glass to ensure long-lasting performance and appearance.

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

In section A4, a weighted average of transport distributed across countries is calculated.

The figures in section A5 originate from data that refer to waste management.

In section C2, it is expected that 70% of the glass is sent to landfill and 30% is sent for recycling, while the remaining materials are either sent for sorting and subsequent recycling, in reference to EN17213:2020.

In section C3, C4 and D-RRR, data from the relevant EPDs pertaining to the materials used is directly referenced.

Transport from production place to user (A4)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Ship, Ferry, Sea (km)	50,0 %	43	0,034	l/tkm	1,46
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	430	0,043	l/tkm	18,49

Assembly (A5)	Unit	Value			
Waste, packaging, pallet, EUR wooden pallet, single use, average treatment (kg)	kg	0,60			

Transport to waste processing (C2)	Capacity utilisation (incl. return) %	Distance (km)	Fuel/Energy Consumption	Unit	Value (Liter/tonne)
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	50	0,043	l/tkm	2,15
Truck, 16-32 tonnes, EURO 6 (km) - Europe	36,7 %	615	0,043	l/tkm	26,45

Waste processing (C3)	Unit	Value			
Materials to recycling (kg)	kg	19,69			
Waste treatment per kg Glass, incineration with fly ash extraction (kg)	kg	1,04			
Waste treatment per kg Non-hazardous waste, incineration with fly ash extraction - C3 (kg)	kg	0,04			

Disposal (C4)	Unit	Value			
Landfilling of ashes from incineration of Glass, process of ashes and residues (kg)	kg	1,04			
Waste, glass, to landfill, inert material landfill (kg)	kg	0,04			
Landfilling of ashes from incineration of Non-hazardous waste, process per kg ashes and residues - C4 (kg)	kg	0,01			
Waste, polyvinylchloride, to landfill (kg) - C4	kg	0,00			

Benefits and loads beyond the system boundaries (D)	Unit	Value			
Substitution of electricity (MJ)	MJ	0,04			
Substitution of thermal energy, district heating (MJ)	MJ	0,59			
Substitution of primary glass with net scrap (kg) - GLO	kg	18,92			
Substitution of electricity (MJ)	MJ	0,41			
Substitution of thermal energy, district heating (MJ)	MJ	6,26			

LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

Environmental impact										
	Indicator	**Unit**	A1-A3	A4	A5	C1	C2	C3	C4	D
	GWP-total	kg CO_2 -eq	3,37E+01	1,61E+00	9,26E-01	0	7,68E-01	1,03E-01	1,15E-02	-1,93E+01
	GWP-fossil	kg CO_2 -eq	3,42E+01	1,60E+00	1,61E-02	0	7,68E-01	1,03E-01	1,15E-02	-1,91E+01
	GWP-biogenic	kg CO_2 -eq	-5,58E-01	6,49E-04	9,10E-01	0	3,18E-04	1,04E-04	8,64E-06	-1,82E-01
	GWP-luluc	kg CO_2 -eq	1,68E-02	5,98E-04	4,14E-06	0	2,73E-04	2,95E-06	3,49E-06	-6,52E-03
	ODP	kg CFC11 -eq	1,71E-06	3,61E-07	2,58E-09	0	1,74E-07	1,01E-09	3,66E-09	-2,90E-03
	AP	mol H+ -eq	1,63E-01	7,64E-03	1,30E-04	0	2,21E-03	3,00E-05	8,28E-05	-2,02E-01
	EP-FreshWater	kg P -eq	1,23E-03	1,24E-05	1,94E-07	0	6,13E-06	1,93E-07	1,11E-07	-3,40E-04
	EP-Marine	kg N -eq	2,72E-02	1,68E-03	5,57E-05	0	4,37E-04	9,05E-06	2,97E-05	-3,18E-02
	EP-Terrestial	mol N -eq	4,08E-01	1,88E-02	5,97E-04	0	4,88E-03	9,40E-05	3,27E-04	-3,90E-01
	POCP	kg NMVOC -eq	9,38E-02	6,04E-03	1,53E-04	0	1,87E-03	3,29E-05	9,45E-05	-9,49E-02
	ADP-minerals&metals[1]	kg Sb-eq	3,03E-04	4,22E-05	2,62E-07	0	2,12E-05	5,51E-08	2,01E-07	-1,63E-03
	ADP-fossil[1]	MJ	4,62E+02	2,40E+01	1,90E-01	0	1,16E+01	5,73E-02	2,69E-01	-2,04E+02
	WDP[1]	m^3	1,38E+03	2,22E+01	2,92E-01	0	1,12E+01	-1,25E-01	4,92E-01	-1,82E+02

GWP-total = Global Warming Potential total; GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment: EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

Remarks to environmental impacts

Additional environmental impact indicators

Indicator		Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
	PM	Disease incidence	3,65E-04	9,48E-08	1,59E-09	0	4,70E-08	1,86E-09	1,53E-09	-2,02E-06
	IRP[2]	kgBq U235 -eq	1,08E+00	1,05E-01	6,88E-04	0	5,07E-02	1,94E-04	1,08E-03	-4,95E-01
	ETP-fw[1]	CTUe	6,91E+02	1,76E+01	2,16E-01	0	8,60E+00	4,02E-01	1,58E-01	-4,10E+02
	HTP-c[1]	CTUh	1,88E-08	0,00E+00	2,40E-11	0	0,00E+00	2,80E-11	5,00E-12	-4,39E-09
	HTP-nc[1]	CTUh	4,27E-07	1,93E-08	1,15E-09	0	9,40E-09	3,54E-10	1,37E-10	-1,41E-07
	SQP[1]	dimensionless	3,90E+02	1,61E+01	1,06E-01	0	8,12E+00	1,41E-02	5,87E-01	-1,01E+02

PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Potential Soil Quality Index (dimensionless)

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

1. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator
2. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Resource use

Indicator		Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
	PERE	MJ	1,02E+02	3,34E-01	3,90E-03	0	1,66E-01	3,96E-03	4,79E-03	-1,29E+01
	PERM	MJ	8,33E+00	0,00E+00	-8,33E+00	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	PERT	MJ	1,11E+02	3,34E-01	-8,32E+00	0	1,66E-01	3,96E-03	4,79E-03	-1,29E+01
	PENRE	MJ	4,38E+02	2,40E+01	1,90E-01	0	1,16E+01	6,17E-02	2,69E-01	-2,04E+02
	PENRM	MJ	2,59E+01	0,00E+00	0,00E+00	0	0,00E+00	-2,59E+01	0,00E+00	0,00E+00
	PENRT	MJ	4,64E+02	2,40E+01	1,90E-01	0	1,16E+01	-2,59E+01	2,69E-01	-2,04E+02
	SM	kg	0,00E+00	0,00E+00	0,00E+00	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	RSF	MJ	2,74E+00	1,18E-02	1,14E-04	0	5,94E-03	8,34E-05	1,27E-04	-6,14E-04
	NRSF	MJ	1,22E-01	4,16E-02	1,30E-03	0	2,13E-02	0,00E+00	3,48E-03	-2,08E-01
	FW	m^3	6,41E-01	2,49E-03	1,38E-04	0	1,24E-03	7,11E-05	2,44E-04	-1,10E-01

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non renewable primary energy resources used as raw materials; PENRT = Total use of non renewable primary energy resources; SM = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Net use of fresh water

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

End of life - Waste

Indicator		Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
	HWD	kg	2,94E-02	1,22E-03	0,00E+00	0	5,99E-04	0,00E+00	1,05E+00	-7,04E-02
	NHWD	kg	7,18E+00	1,11E+00	6,00E-01	0	5,64E-01	1,08E+00	4,88E-02	-1,29E+00
	RWD	kg	1,99E-03	1,64E-04	0,00E+00	0	7,91E-05	0,00E+00	1,64E-06	-6,70E-04

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

End of life - Output flow

Indicator		Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
	CRU	kg	0,00E+00	0,00E+00	0,00E+00	0	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	MFR	kg	3,84E+00	0,00E+00	1,41E-05	0	0,00E+00	1,97E+01	0,00E+00	0,00E+00
	MER	kg	6,08E-02	0,00E+00	5,95E-01	0	0,00E+00	1,08E+00	0,00E+00	0,00E+00
	EEE	MJ	3,61E-02	0,00E+00	4,14E-01	0	0,00E+00	1,39E-02	0,00E+00	0,00E+00
	EET	MJ	5,46E-01	0,00E+00	6,26E+00	0	0,00E+00	2,10E-01	0,00E+00	0,00E+00

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

"Reading example: 9,0 E-03 = 9,0*10-3 = 0,009"
*INA Indicator Not Assessed

Biogenic Carbon Content

Indicator	Unit	At the factory gate
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in accompanying packaging	kg C	2,48E-01

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO2

Additional requirements

Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

Electricity mix	Source	Amount	Unit
Electricity, Denmark (kWh)	ecoinvent 3.6	338,20	g CO2-eq/kWh

Dangerous substances

The product contains substances given by the REACH Candidate list that are less than 0,1 % by weight.

Indoor environment

Additional Environmental Information

Additional environmental impact indicators required in NPCR Part A for construction products									
Indicator	**Unit**	A1-A3	A4	A5	C1	C2	C3	C4	D
GWPIOBC	kg CO_2 -eq	3,68E+01	1,61E+00	1,61E-02	0	7,68E-01	5,72E-02	1,16E-02	-1,93E+01

GWP-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

Bibliography

ISO 14025:2010 Environmental labels and declarations - Type III environmental declarations - Principles and procedures.
ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines.
EN 15804:2012+A2:2019 Environmental product declaration - Core rules for the product category of construction products.
ecoinvent v3, Allocation, cut-off by classification, Swiss Centre of Life Cycle Inventories.
Iversen et al., (2021) eEPD v2021.09 Background information for EPD generator tool system verification, LCA.no Report number: 07.21
Author(s)., (2022) EPD generator for xx, Background information for EPD generator application and LCA data, LCA.no report number: xx.xx
NPCR Part A: Construction products and services. Ver. 2.0. April 2021, EPD-Norge.
NS-EN 17074:2019 Glass in building - Environmental product declaration - Product category rules for flat glass products.

DS-EN 12150-1:2015 Glass in building. Thermally toughened soda lime silicate safety glass - Part 1. DS-EN 14449:2005 Glass in building - Laminated glass and laminated safety glass.

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