ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration:	Pretec Norge AS
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	EPD-BMG-10.2
Registration number:	NA
ECO Platform reference number:	NA
Issue date:	11.05.2022
Valid to:	11.05.2027

Lattice girder tunnel

Pretec Norge AS

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General information

Product:

Lattice girder tunnel

Owner of the declaration:

Pretec Norge AS
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Program operator:

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Manufacturer:

Pretec Norge AS

Declaration number:

EPD-BMG-10.2

Place of production:

Pretec Norge AS
Kampenesmosen 3 1739 Borgenhaugen
Norway

ECO Platform reference number:

Management system:

ISO 14001 and ISO 9001, AAA Sertification AB, sert no 794 - EN 1090-1, AAA Sertification AB, sert no 2296

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A1:2013 serves as core PCR
NPCR 013:2019 Part B for Steel and aluminium construction products

Organisation no:

NO 980 429 245 MVA

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.

Issue date:

11.05.2022

Valid to:

11.05.2027

Declared unit:

1 kg Lattice girder tunnel

Year of study:

2021

Declared unit with option:

A1,A2,A3,A4,C1,C2,C3,C4,D

Comparability:

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

Functional unit:

Lattice girder for tunnels

Development and verification of EPD:

The declaration has been developed and verified using EPD tool lca.tools ver EPD2020.11, developed by LCA.no AS. The EPD tool is integrated into the company's environmental management system, and has been approved by EPD-Norway

Developer of EPD:

Lars Rune Aasberg

Reviewer of company-specific input data and EPD:

Fredrik Eggertsen

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. Individual third party verification of each EPD is not required when the EPD tool is i) integrated into the company's environmental management system, ii) the procedures for use of the EPD tool are approved by EPDNorway, and iii) the proccess is reviewed annualy. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools.

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.

Fredrik Moltu Johnsen, Norsus AS

(no signature required)

Approved:

Sign

Håkon Hauan, CEO EPD-Norge

Product

Product description:

Prefabricated 4 bar girder system. Offers immediate support in excavation area.

Entirely integrated in the shotcrete lining; porous zones and shotcrete spray shadows are avoided.

Product specification

Girders are conencted by welded stiffening elements. Assembly of vault by connecting indicivual girder elements.

Materials	kg	%
Steel	1,00	100,00
Total:	1,00	

Technical data:

Girder bars: Reinforcing steel B500B or higher acc DIN 488-1
Stiffener: B500B acc to DIN 488-1

Market:

Europe

Reference service life, product

Reference service life, building

LCA: Calculation rules

Declared unit:

1 kg Lattice girder tunnel

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.

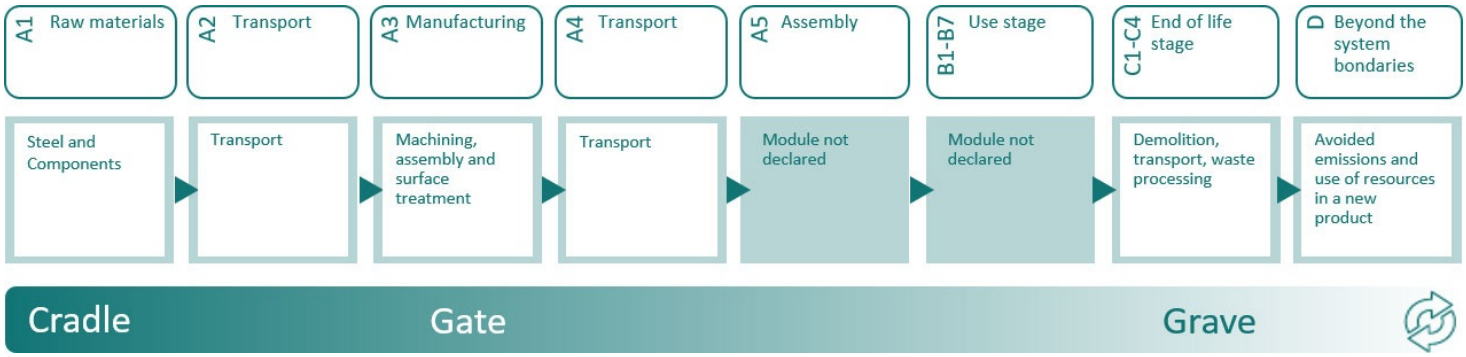
Data quality:

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

Materials	Source	Data quality	Year
Steel	EPD-BMG-GB-10.2	EPD	2018

System boundary:

This EPD is a "cradle-to-gate with options" EPD. The system boundary for this LCA report is from A1 to A4, C1-C4 and D. Product is made in EU country.
Energy consumption for storage and internal transport at Pretec warehouse is included in A3.
Transport distance in A4 is an average transport distance to Norwegian customers.



Additional technical information:

LCA: Scenarios and additional technical information

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

Module C "End of life stage" is a generic scenario for decommissioning of construction. Subject to project specific conditions. Grade of recycling for different steel grades is based on statistics obtained from Norsk Stålforbund.

Transport from production place to user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Unit	Value (l/t)
Truck	55,0 %	Truck, lorry over 32 tonnes, EURO 6	300	0,022606	l/tkm	6,78
Railway					l/tkm	
Boat					l/tkm	
Other Transportation					l/tkm	

End of Life (C1, C3, C4)

.	Unit	Value
Hazardous waste disposed	kg	
Collected as mixed construction waste	kg	
Reuse	kg	
Recycling	kg	0,6700
Energy recovery	kg	
To landfill	kg	0,3300

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Unit	Value (l/t)
Truck	55,0 %	Truck, lorry over 32 tonnes, EURO 6	100	0,022606	l/tkm	2,26
Railway					l/tkm	
Boat					l/tkm	
Other Transportation					l/tkm	

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Benefits and loads beyond the system boundaries (D)

.	Unit	Value
Substitution of primary reinforcing steel, with net scrap steel (kg)	kg	-0,48

LCA: Results

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

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

Product stage			Construction installation stage		User stage							End of life stage				.	Beyond the system bondaries
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	X	X	X	.	X

Environmental impact

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
GWP	kg CO_2 -eq	3,81E-01	2,48E-02	5,67E-02	8,28E-03	1,34E-04	1,71E-03	8,03E-01
ODP	kg CFC11 -eq	1,50E-08	5,10E-09	9,82E-09	1,70E-09	1,50E-11	5,68E-10	3,31E-08
POCP	kg C_2H_4-eq	7,57E-05	3,88E-06	9,50E-06	1,29E-06	3,67E-08	5,22E-07	5,60E-04
AP	kg SO_2 -eq	1,13E-03	6,41E-05	4,30E-04	2,14E-05	8,36E-07	1,25E-05	3,58E-03
EP	kg PO_4^{3-} -eq	2,46E-04	8,84E-06	9,36E-05	2,95E-06	1,28E-07	2,20E-06	1,19E-03
ADPM	kg Sb -eq	4,77E-07	5,91E-08	2,45E-10	1,97E-08	1,00E-11	3,30E-11	1,55E-05
ADPE	MJ	5,95E+00	4,08E-01	7,84E-01	1,36E-01	1,25E-03	4,81E-02	7,55E+00

GWP Global warming potential; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non fossil resources; ADPE Abiotic depletion potential for fossil resources

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

Resource use

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
RPEE	MJ	3,40E-01	7,41E-03	4,27E-03	2,47E-03	1,04E-02	3,93E-04	6,80E-01
RPEM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	2,58E+00	7,41E-03	4,27E-03	2,47E-03	1,04E-02	3,93E-04	6,80E-01
NRPE	MJ	1,15E+00	4,20E-01	7,91E-01	1,40E-01	1,68E-03	4,88E-02	7,16E+00
NRPM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	7,66E+00	4,20E-01	7,91E-01	1,40E-01	1,68E-03	4,88E-02	7,16E+00
SM	kg	1,15E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	3,81E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
W	m^3	9,20E-01	9,95E-05	6,80E-05	3,32E-05	6,90E-07	5,28E-05	4,90E-03

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE 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; W Use of net fresh water

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

End of life - Waste

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
HW	kg	5,21E-02	2,24E-07	2,15E-06	7,47E-08	4,14E-09	7,26E-08	6,95E-05
NHW	kg	2,31E+00	3,84E-02	3,56E-03	1,28E-02	1,27E-04	3,30E-01	1,37E+00
RW	kg	INA*	INA*	INA*	INA*	INA*	INA*	INA*

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

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

End of life - Output flow

Parameter	Unit	A1-A3	A4	C1	C2	C3	C4	D
CR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,70E-01	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	INA*	INA*	INA*	INA*	INA*	INA*	INA*
ETE	MJ	INA*	INA*	INA*	INA*	INA*	INA*	INA*

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

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

Additional Norwegian 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	Data source	Amount	Unit
El-mix, Norway (kWh)	ecoinvent 3.4	31,04	g CO2-ekv/kWh

Dangerous substances

The product contains no substances given by the REACH Candidate list or the Norwegian priority list.

Indoor environment

The product has no effect on indoor climate.

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+A1:2013 Environmental product declaration - Core rules for the product category of construction products.
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NPCR 013 Part B for steel and aluminium construction products. Ver. 3.0 April 2019, EPD-Norge.

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