

Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

Norskreen M4



Business Foundation for
Environmental
Declarations

Owner of the declaration:
Byggimpuls AS

Product:
Norskreen M4

Declared device:
1 m2

The declaration is based on PCR:
EN 15804:2012+A2:2019 serves as the core PCR
NPCR 020:2021 Part B for Concrete and concrete
elements

Programme operator:
Business Foundation for Environmental
Declarations

Declaration number :
NEPD-6868-6168-NO

Publication number :
NEPD-6868-6168-NO

Approved date: 13.06.2024

Valid until: 13.06.2029

EPD software:
LCAno EPD generator ID: 59596

General information

Norskreen

Programme operator:

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Declaration number :

NEPD-6868-6168-NO

The declaration is based on PCR:

EN 15804:2012+A2:2019 serves as the core PCR
NPCR 020:2021 Part B for Concrete and concrete elements

Declaration of liability:

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

Declared device:

1 m2 Norskreen M4

Declared device with option:

A1,A2,A3,A4,A5,C1,C2,C3,C4,D

Functional unit:

Produced and sold in m2

General about verification of EPD from tools:

Independent verification of data, other environmental information and EPDs is carried out in accordance with ISO 14025:2010, chapters 8.1.3 and 8.1.4. Verification of each EPD is carried out in accordance with EPD-Norway's guidelines for verification and approval, which require that EPD tools are i) integrated into the company's environmental management system, ii) procedures for using EPD tools are approved by EPD-Norway and iii) the process is reviewed annually by an independent third-party verifier. See Appendix G in EPD Norway's guidelines for more information on EPD tools.

Verification of EPD tools:

Independent third-party verification of tools, background data and test EPD has been carried out in accordance with EPD Norway's procedures and guidelines for verification and approval of EPD tools.

Third party verifier:

Jane Anderson, Construction LCA Ltd

(does not require signature)

ProductOwner of the declaration:

M4Byggimpuls AS
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Manufacturer:

Byggimpuls AS

Production site:

Byggimpuls AS
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Quality/Environmental system:

Org. no.:

987975105

Approved date:

13.06.2024

Valid until:

13.06.2029

Year of the study:

2022

Comparability:

EPDs of building products are not necessarily comparable if they do not comply with NS-EN 15804 and are viewed in a building context.

Preparation and verification of environmental declaration:

The declaration has been prepared and verified using the EPD tool lca.tools ver EPD2022.03, developed by LCA.no. The EPD tool is integrated into the company's environmental management system, and approved by EPD Norway NEPD03.

EPD is prepared by: Torbjørn Kløfta

Company specific data and EPD are controlled by: Odd Åge Steine

Approved:



Håkon Hauan, CEO EPD Norway

Product

Product description:

Fibre-reinforced concrete façade elements are injection-moulded fibreglass concrete elements for installation on façades with brackets or other fasteners. The elements are customised to order and based on drawings from architects or in-house designers and according to RIB's calculations. The dimensions vary, but the material has the same properties per square metre for all manufactured elements. Due to fibre concrete's unique structure and strength, elements as thin as 10 mm can be produced, which can be very economical in terms of space, time and cost. Fibre-reinforced concrete can also be coloured with pigments and designed with all kinds of surface textures, which gives the product great potential.

Product specification:

1m² of M4 façade element in fibre concrete has the following components:

23.5 kg cement, 23.5 kg sand, 1.88 l Polycure FT, 0.2 Flowaid FT, 6.3 l water and 5% of the total weight of the element in glass fibre strands.

Materials	kg	%
Filler	23,53	39,84
Glass fibre	2,95	5,00
Cement	23,53	39,84
Additives	2,35	3,97
Water	6,70	11,35
Total	59,05	100,00

Technical data:

Injection moulded glass fibre reinforced concrete Grade 18P, with 5% glass fibre content of the mix weight has the following mechanical properties: Bending:

Ultimate strength (modulus of rupture-MOR) 20-30 MPa

Elastic limitation (limitation of proportionality-LOP) 7-11 MPa

Tension:

Ultimate strength (Ultimate tensile strength-UTS): 8-11 MPa

Elastic limitation (Bending point-BOP): 5-7 MPa

Shear:

Interlaminar shear strength: 3-5

MPa In level shear strength: 8-11

MPa Compressive strength: 50-80

MPa

Collision strength: 10-25

kJ/m² Elastic modulus: 10-20

GPa Load to failure 0.6-1.2%

Dry density: 1.9-2.1 tonnes

Fibre-reinforced concrete is a non-combustible material and will have a positive impact on the building's resistance to fire.

Market area:

Fibre-reinforced concrete modules and elements have a very broad market - everything from the production of furniture and other interior and exterior solutions for private individuals to larger facade and other element solutions for major construction projects. Byggimpuls AS sells mainly to the Norwegian market, both to private and public sector organisations. Some reference projects are Kilden Concert Hall in Kristiansand and Vulkan Søndre Kvarter in Oslo. Byggimpuls also sells furniture and facades abroad, particularly to Sweden.

Lifetime, product:

60 years

Lifetime, building or facility:

60 years

LCA: Calculation rules

Declared device:

1 m² Norscreen M4

Cut-off criteria:

All key raw materials and all key energy uses are included. The production process of the raw materials and energy flows that are included in very small quantities (less than 1%) are not included. These cut-off criteria do not apply to hazardous materials and substances.

Allocation:

Allocation is made in accordance with the provisions of EN 15804. Incoming energy and water, as well as the production of waste in our own production, are allocated equally between all products through mass allocation. Environmental impact and resource consumption for the primary production of recycled materials are allocated to the original product system. The machining process and transport of the material to the production site are allocated to the analysis in this EPD.

Data quality:

Specific data for the product composition is provided by the manufacturer. They represent the production of the declared product and were collected for EPD development in the given year of the study. Background data is based on EPDs according to EN 15804 and various LCA databases.

The data quality for the raw materials in A1 is presented in the table below.

Materials	Source	Data quality	Year
Filler	ecoinvent 3.6	Database	2019
Glass fibre	ecoinvent 3.6	Database	2019
Cement	NEPD-3945-2910-NO	EPD	2022
Additives	ecoinvent 3.6	Database	2019
Additives	EPD-EFC-20210198-IBG1-EN	EPD	2021
Water	ecoinvent 3.6	Database	2019

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

Product phase			Assembly phase		Use phase							Final phase				Gains and burdens after end of life (D)
Raw materials	Transport	Manufacturing	Transport	Construction/installation phase	Usage	Maintenance	Repairs	Replacements	Refurbishment	Operational energy use	Operational water use	Dismantling	Transport	Waste treatment	Waste for final treatment	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	MNR	MNR	MNR	MNR	MNR	MNR	X	X	X	X	X

System limits:

This analysis covers steps A1-A3 in the production process. A4-A5 installation.

B1 use.

C1-C4 Disposal of the product.

D reuse/recycling.

The flowchart below illustrates the system boundaries for the analysis:



Additional technical information:

The total mass of a fibre-reinforced concrete façade is approximately 7 to 10 times lower than that of a solid concrete façade, and 2 to 3 times lower than natural stone façades. This reduces the demand on the rest of the building's structure, as it has to carry a much smaller mass. Fibre-reinforced concrete is maintenance-free throughout its lifetime and, compared to concrete, is a less environmentally damaging alternative. Using fibre concrete reduces CO2 emissions, electricity consumption, oil consumption and construction time. Byggimpuls Fibre Concrete is rated A+ by BREEAM UK.

LCA: Scenarios and other technical information

The following information describes the scenarios for the modules in the EPD.

Transport from production site to user (A4)	Capacity utilisation incl. returns (%)	Distance (km)	Fuel/energy consumption	Unit	Verdi (litres/tonne)
Lorry with trailer, EURO 6	53,3 %	50	0,023	l/tkm	1,15
Construction phase (A5)	Unit	Verdi			
Diesel (L)	L/DU	2,50			
Dismantling (C1)	Unit	Verdi			
Demolition of buildings or facilities, per kg concrete C1 (kg)	kg/DU	50,00			
Transport to waste treatment (C2)	Capacity utilisation incl. returns (%)	Distance (km)	Fuel/energy consumption	Unit	Verdi (litres/tonne)
Lorry, EURO 6	36,7 %	50	0,043	l/tkm	2,15
Waste treatment (C3)	Unit	Verdi			
Waste treatment of concrete after demolition (kg)	kg	34,00			
Waste for final treatment (C4)	Unit	Verdi			
Waste, concrete sludge, residual concrete, for disposal (kg)	kg	16,00			
Benefits and burdens after end of life (D)	Unit	Verdi			
Substitution of stone materials (kg)	kg	34,00			

LCA: Results

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

Environmental impact (Environmental impact)												
Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	Total GWP	kg CO ₂ - ekv	2,65E+01	1,20E+00	1,33E+00	2,18E-01	8,84E+00	2,00E-01	4,09E-01	2,45E-02	6,86E-02	-7,94E-02
	GWP fossil	kg CO ₂ - ekv	2,64E+01	1,20E+00	1,21E+00	2,18E-01	8,84E+00	2,00E-01	4,08E-01	2,41E-02	6,85E-02	-7,78E-02
	GWP-biogenic	kg CO ₂ - ekv	9,42E-02	5,03E-04	1,21E-01	9,33E-05	1,66E-03	3,75E-05	1,69E-04	2,09E-04	5,83E-05	-1,55E-03
	GWP-luluc	kg CO ₂ - ekv	9,10E-03	3,95E-04	2,94E-03	6,63E-05	6,96E-04	1,58E-05	1,45E-04	3,34E-05	1,34E-05	-5,26E-05
	ODP	kg CFC11 - ekv	9,57E-07	2,87E-07	6,39E-08	5,25E-08	1,91E-06	4,32E-08	9,25E-08	4,76E-09	3,34E-08	-1,42E-08
	AP	mol H ⁺ - ekv	1,00E-01	6,05E-03	6,11E-03	7,01E-04	9,24E-02	2,09E-03	1,17E-03	1,95E-04	6,69E-04	-7,01E-04
	EP-FreshWater	kg P - ekv	5,52E-04	9,26E-06	5,24E-05	1,73E-06	3,22E-05	7,28E-07	3,26E-06	1,53E-06	5,11E-07	-2,07E-06
	EP Marine	kg N - ekv	1,69E-02	1,39E-03	1,00E-03	1,54E-04	4,08E-02	9,24E-04	2,32E-04	5,73E-05	2,51E-04	-2,43E-04
	EP-Terrestrial	mol N - ekv	1,92E-01	1,55E-02	1,04E-02	1,71E-03	4,48E-01	1,00E-02	2,60E-03	6,60E-04	2,76E-03	-2,86E-03
	POCP	kg NMVOC - ekv	5,19E-02	5,20E-03	2,80E-03	6,72E-04	1,23E-01	2,79E-03	9,95E-04	1,77E-04	7,90E-04	-7,54E-04
	ADP minerals&metals ¹	kg Sb- ekv	3,75E-04	2,06E-05	5,39E-05	3,88E-06	1,36E-05	3,07E-07	1,13E-05	3,06E-07	6,06E-07	-6,91E-06
	ADP-fossil ¹	MJ	1,85E+02	1,92E+01	1,07E+01	3,54E+00	1,22E+02	2,75E+00	6,17E+00	7,50E-01	2,21E+00	-1,32E+00
	WDP ¹	m ³	1,12E+03	1,42E+01	1,69E+03	2,71E+00	2,58E+01	5,85E-01	5,97E+00	8,28E+01	4,65E+00	-6,17E+01

GWP-total = Global warming potential total; GWP-fossil = Global warming potential fossil fuels; GWP-biogenic = Global warming potential biogenic sources; GWP-luluc = Global warming potential land use and land use change; ODP = Stratospheric ozone depletion potential; AP = Acidification potential for land and water sources; EP = eutrophication potential of freshwater, ocean and soil; POCP = photochemical oxidation potential; ADP-minerals&metals = abiotic depletion potential of non-fossil resources, minerals and metals; ADP-fossil = abiotic depletion potential of fossil resources, fossil fuels; WDP = Depletion potential of water resources

"Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009"

*INA Indicator Not Assessed (indicator not assessed)

1. The results of this environmental impact indicator should be used with caution as the uncertainty of the results is high or there is limited experience in using the indicator.

Note on the environmental impact

Supplementary indicators for environmental impact

Indicator	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
 PM	Cases of disease	5,75E-07	1,03E-07	4,69E-08	2,00E-08	2,45E-06	2,53E-07	2,50E-08	3,13E-09	1,42E-08	-1,49E-08
 IRP ²	kgBq U235 -ekv	6,50E-01	8,40E-02	1,79E-01	1,55E-02	5,21E-01	1,20E-02	2,70E-02	1,26E-02	9,60E-03	-1,21E-02
 ETP-fw ¹	CTUe	5,78E+02	1,39E+01	4,69E+01	2,59E+00	6,65E+01	1,51E+00	4,58E+00	5,31E-01	1,09E+00	-1,36E+00
 HTP-c ¹	CTUh	1,41E-08	0,00E+00	2,27E-09	0,00E+00	2,58E-09	5,00E-11	0,00E+00	3,40E-11	3,20E-11	-6,80E-11
 HTP-nc ¹	CTUh	4,48E-07	1,29E-08	5,56E-08	2,50E-09	6,11E-08	1,40E-09	5,00E-09	4,76E-10	6,40E-10	-1,67E-09
 SQP ¹	dimensionless	4,27E+01	2,11E+01	6,48E+00	4,05E+00	1,54E+01	3,35E-01	4,32E+00	4,24E-01	8,06E+00	2,99E+00

PM = Particle emissions; IRP = Ionising radiation (health effect); ETP-fw = Ecotoxicity (freshwater); HTP-c = Human toxicity, cancer; HTP-nc = Toxicity impact on humans, effects other than cancer; SQP = Impacts related to land use change / soil quality

"Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009"

*INA Indicator Not Assessed (indicator not assessed)

1. The results of this environmental impact indicator should be used with caution as the uncertainty of the results is high or there is limited experience of using the indicator.
2. This impact category mainly deals with the possible effect of low-dose ionising radiation on human health in the nuclear fuel cycle. It does not take into account effects due to possible nuclear accidents, occupational exposure or due to the removal of radioactive waste in underground facilities. Potential ionising radiation from the soil, from radon and from some building materials are also not measured by this indicator.

Resource use (Resource use)

Indicator	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
 PERE	MJ	3,03E+01	2,36E-01	1,25E+02	4,45E-02	6,58E-01	1,50E-02	8,84E-02	3,86E-01	3,40E-02	-3,08E-01
 PERM	MJ	3,92E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
 PERT	MJ	3,03E+01	2,36E-01	1,25E+02	4,45E-02	6,58E-01	1,50E-02	8,84E-02	3,86E-01	3,40E-02	-3,08E-01
 PENRE	MJ	2,01E+02	1,92E+01	1,08E+01	3,54E+00	1,22E+02	2,75E+00	6,17E+00	7,50E-01	2,21E+00	-1,39E+00
 PENRM	MJ	1,94E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
 PENRT	MJ	2,03E+02	1,92E+01	1,08E+01	3,54E+00	1,22E+02	2,75E+00	6,17E+00	7,50E-01	2,21E+00	-1,39E+00
 SM	kg	5,27E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,35E-03	0,00E+00	6,45E-04	0,00E+00	-2,66E-03
 RWB	MJ	2,79E+01	8,20E-03	9,90E-02	1,56E-03	1,62E-02	3,66E-04	3,16E-03	7,82E-03	7,03E-04	-6,31E-03
 NRSF	MJ	3,85E+01	2,91E-02	2,48E-01	5,22E-03	2,38E-01	-5,50E-03	1,13E-02	-4,84E-04	2,02E-03	-6,48E-03
 FW	m ³	2,68E-01	2,13E-03	9,36E-01	4,02E-04	6,26E-03	1,42E-04	6,60E-04	1,28E-03	2,63E-03	-4,84E-02

PERE = Renewable primary energy used as energy carrier; PERM = Renewable primary energy used as raw material; PERT = Total use of renewable primary energy; PENRE = Non-renewable primary energy used as energy carrier; PENRM = Non-renewable primary energy used as raw material; PENRT = Total use of non-renewable primary energy; 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 (indicator not assessed)

End of life - Waste (End of life - Waste)

Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	HWD	kg	2,27E-02	1,04E-03	2,04E-01	1,94E-04	3,58E-03	8,11E-05	3,18E-04	7,49E-05	0,00E+00	-3,17E-04
	NHWD	kg	2,11E+00	1,59E+00	2,96E+00	3,07E-01	1,44E-01	3,26E-03	3,00E-01	2,37E-03	1,60E+01	-9,63E-03
	RWD	kg	8,18E-04	1,31E-04	9,08E-05	2,42E-05	8,44E-04	1,91E-05	4,21E-05	7,93E-06	0,00E+00	-1,04E-05

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

"Reading example: 9,0 E-03 = $9,0 \cdot 10^{-3}$ = 0,009"

*INA Indicator Not Assessed (indicator not assessed)

End of life - Output flow (End of life - Output flow)

Indicator		Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
	CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	MFR	kg	3,75E-02	0,00E+00	3,73E-01	0,00E+00	0,00E+00	1,33E-03	0,00E+00	3,40E+01	0,00E+00	-6,24E-05
	MORE	kg	5,62E-03	0,00E+00	7,15E-06	0,00E+00	0,00E+00	4,12E-06	0,00E+00	7,83E-05	0,00E+00	-2,33E-03
	EEE	MJ	8,48E-03	0,00E+00	9,49E-01	0,00E+00	0,00E+00	1,41E-05	0,00E+00	1,34E-04	0,00E+00	-5,63E-04
	EET	MJ	1,28E-01	0,00E+00	1,44E+01	0,00E+00	0,00E+00	2,14E-04	0,00E+00	2,03E-03	0,00E+00	-8,52E-03

CRU = Components for reuse, MFR Materials for recycling, MER = Materials for energy recovery, EEE = Exported electrical energy; EET = Exported thermal energy

"Reading example: 9,0 E-03 = $9,0 \cdot 10^{-3}$ = 0,009"

*INA Indicator Not Assessed (indicator not assessed)

Information about the biogenic carbon content

Indicator	Unit	At the gate
Content of biogenic carbon in product	kg C	0,00E+00
Content of biogenic carbon in the packaging	kg C	1,07E-03

Notes: 1 kg of biogenic carbon equals 44/12 kg of CO₂

Additional requirements

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

The national production mix from imports, low voltage (including production of transmission lines, in addition to direct emissions and grid losses) is used for electricity used in the production process (A3). Background data is presented in the table below. Characterisation factors from EN15804:2012+A2:2019 have been used.

Electricity mix	Source	Quantity	Unit
Electricity, Norway (kWh)	ecoinvent 3.6	24,33	g CO2-eq/kWh

Hazardous substances

The product contains substances that are below 0.1% by weight on the REACH Candidate List and the Norwegian Priority List.

Indoor climate

The product has no impact on indoor climate

Additional environmental information

Additional environmental impact indicators required in NPCR Part A for construction products											
Indicator	Unit	A1	A2	A3	A4	A5	C1	C2	C3	C4	D
GWPIOBC	kg CO ₂ -ekv	2,60E+01	1,20E+00	7,28E-01	2,18E-01	8,84E+00	2,68E+02	4,09E-01	0,00E+00	0,00E+00	-8,33E-02

GWP-IOBC: Global warming potential calculated according to the principle of instantaneous oxidation. To increase the clarity 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 the context of the Swedish Public Procurement Act.

Bibliography

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NPCR Part A: Construction products and services. Ver. 2.0. April 2021, EPD Norway.

NPCR 020 Part B for concrete and concrete elements, Ver. 3.0, 20.09.2021, EPD Norway.

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