



ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO14025 and EN15804+A2:2019 for

Polyethylene Pressure Pipe

Manufactured by Firat Plastik

Programme:
The International EPD® System

Programme Operator:
EPD International AB

Local Operator:
EPD Türkiye

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Türkiye

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com.

PROGRAMME INFORMATION

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ISO standard ISO 21930 and CEN standard EN 15804 serves as the core Product Category Rules (PCR)

Product Category Rules (PCR):

2019:14 Version 1.2.5, Construction Products and Construction Services, EN 15804:2012 + A2:2019 Sustainability of Construction Works

PCR review was conducted by:

The Technical Committee of the International EPD® System. Review chair: Claudia A. Peña, University of Concepción, Chile

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

EPD process certification

EPD verification ✓

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Approved by: The International EPD® System Technical Committee, supported by the Secretariat

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes

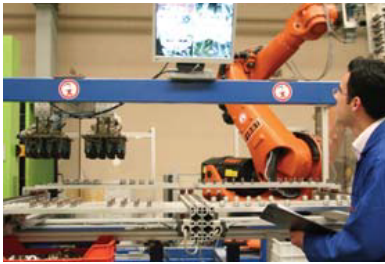
No ✓

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

ABOUT FIRAT PLASTİK

FIRAT was established in 1972 to make production in the field of plastic construction materials FIRAT, who has always followed its principle of "Quality Production at All Times" and "quality product diversity", has managed to become "the leader of sector" as well as "the export leader of sector" as a result of the serious enterprises.

With its plastic-based products, FIRAT makes production for various sectors like construction, agriculture, automotive, medical and white goods. It carries out its manufacturing process for these sectors in its factories of 750.000 m² in total in Istanbul-Buyukcekmece and Ankara-Sincan. FIRAT owns one of the five biggest manufacturing complexes of Europe.



Product Range and Groups

Product diversity of FIRAT is over 4500. For our customers to obtain the optimum benefit and satisfaction out of these products, FIRAT makes production as integrated [completing one another] systems.

Thousands of FIRAT products like PVC Door and Window Profiles, PVC Rain Gutters and Fittings, PVC Drinking Water Pipes, PVC Waste Water Pipes, PVC Hose Groups, Rubber and PE Based Hoses, PPRC Sanitary Installation Pipes and Fittings, HDPE Pipes, EF Fittings, PE Fittings, PE 80 Natural gas Pipes, Tunnel Type Drainage Pipes, Drainage Pipes, Telecommunication Cable Protection Pipes, EPDM Sealing Manufacturing, TPE Sealing Manufacturing, Metal Injection Production [hinge and window connection components], PEX Mobile System and Floor Heating Pipes, PEX Pipe Metal Fittings, Pex Al Pex Pipe, Irrigation Pipes and Fittings, Medical Products render service in numerous parts of Turkey and the world.



Quality and Control

Quality Control Process employed in laboratories consists of three phases:

1. Incoming Quality Control
2. Process Quality Control
3. Output-Final Quality Control

Incoming Quality Control

All types of raw materials and auxiliary materials from our suppliers are subjected to Input Quality Control tests according to the quality production standards set out by FIRAT. Samples randomly chosen from each lot of raw materials and auxiliary materials supplied in lots by our suppliers have to pass through Appearance Marking Compliance, Physical Compliance, Chemical Compliance and Functional Compliance tests in GKK Laboratories and obtain "Suitable for Production" approval.

Process Quality Control

In the production process implemented with raw materials and auxiliary materials bearing "Suitable for Production" approval, samples taken on production lines during or soon after production are passed through Process Quality Control tests in FIRAT laboratories determined by national [TSE] and international [DVGW, SKZ, EN, DIN, etc.] standard institutions and recorded regularly. Main Process Quality Control tests are as follows:

- Blow Strength Test
- Hydrostatic Compression Test (for products to operate in pressurized lines)
- Longitudinal Variation [resistance against heat]
- Density Test
- Homogeneity Test
- Melt Flow Speed Test

At the phase of Process Quality Control; diameter, thickness and ovality measurements are conducted by ultrasonic measurement devices on all production lines in fully automated manner simultaneously with the production process and faulty production is not allowed upon activation of sound and light warning system under out of standard cases.

The products have to pass through all tests conducted in accordance with the control frequency and numbers set out in the standards and obtain "Suitable for Sale" approval.

Output - Final Quality Control

The products which obtained "Suitable for Sale" approval also have to get "Suitable for Output" approval passing through Packaging Compliance, Pack Compliance, Description and Label Compliance checks soon after automatic packaging and wrapping processes.

In addition to the quality control tests conducted in FIRAT laboratories, all the products are sampled from the production lines regularly twice a year and subjected to quality and sanitary compliance tests by international test and certification institutions such as DVGW, SKZ, AENOR, TUV and SEPRO.

Our products which passed through all these tests and met the required quality conditions are offered to our customers.



ABOUT THE PRODUCT

This EPD is an average EPD consisting of three similar HDPE pipes manufactured by Fırat Plastik at Büyükçekmece plant. Products that are investigated are listed below.

- PE100
- FKS
- Triplex

PE100 is mainly used for potable water and natural gas networks areas. FKS and Triplex are used for underground sewage and drainage systems. Main raw material used for all three products is high density polyethylene. For PE100 manufacturing, the raw materials are HDPE and masterbatch. For FKS and Triplex production, there are use of glass fiber and some additives. Environmental performance for all the considered stages for these products are investigated. According to the analysis, PE100 bears the highest environmental impacts among the three. Thus, LCA results in this EPD are specific to PE100 product.

Raw material composition for PE100 is provided below. There is no use of packaging materials since the product is directly loaded to trucks by forklifts/cranes and secured via ratchet ropes.

Material composition	Weight percentage (%)
HDPE	98
Masterbatch	2



ABOUT THE PRODUCT

Developed at the beginning of 1990, third generation PE 100 raw material gets to be both high performance and economic solution to the potable water and natural gas networks areas.

- First generation raw materials: PE 32 (LDPE), PE 40 (LDPE), PE 63 (HDPE)
- Second generation raw materials: PE 80 (MDPE), PE 80 (HDPE)
- Third generation raw materials: PE 100 (HDPE)

Firat increased its product range from Ø 1600mm up to Ø 2500 mm in 2013. Pipes are produced in coils up to Ø 125 mm and in 12-13 m lengths at Ø 125 mm and above, in addition monolith pipe production at lengths of 250 or 500 m to be transported over sea in the special projects.

Advantages of Polyethylene Pipes

- High stretch capability. By this means, they provide easiness in assembly. Breaking strain is minimum 350%.
- Do not get affected from underground movements and not breakable.
- High impact resistance and crack-spreading resistance.
- Since their internal surface smoothness is low, it provides important advantages while selecting diameter in projecting.
- Appropriate to undersea installation, and do not get affected from sea water and sea movements.
- Due to linking method, no montage loss.
- Serves free-of-problem under nominal operational pressure for minimum 50 years.
- UV-light resistance.
- Do not get affected from harmful substances contained in the earth structure and having corrosive effects.
- Therefore, they do not require cathodic protection.
- Resistant against chemical substances.
- Do not change the smell and taste of the water, therefore it is sanitary.

ABOUT THE PRODUCT

TECHNICAL SPECIFICATIONS

Raw materials used in the polyethylene pipe and fitting productions are classified with MRS (Minimum Required Strength) according to mechanic resistance criteria. MRS is the resistance value of material against inner pressure at 20 °C for 50 years. According to MRS, PE materials are classified in the side figure.

Safety co-efficient is determined according to class of raw material and state of the network in the PE pipe networks and all calculations are made according to this co-efficient. The safety co-efficient in the natural gas networks is C=2.0, safety co-efficient in the potable water distribution lines is C=1.25.

Polymer Data	Unit	Test Method	PE 40	PE 80	PE 80	PE 100
Colour			Black	yellow	black	Black/blue
Density(23°C)	g / cm ³	ISO 1183	>0,930	>0,930	>0,950	>0,950
MFR (190°C / 5kg)	g / 10 minute	ISO 1183	-	0,8-1,3	0,4-0,7	0,3-0,7
Mechanical Properties						
Elongation At Break	%	ISO 527	min % 350	min % 350	min % 350	min % 350
Elasticity Module	MPa	ISO 527	>500	>700	>700	>1000
Other Properties						
Oxidization Initial Time	minute	EN 728	>20	>20	>20	>20
Carbon Black Amount	%	ISO 6964	2-2.5	-	2-2.5	2-2.5
Carbon Black Distribution	Nominal	ISO 11420	max 3	-	max 3	max 3

SYSTEM BOUNDARIES & DESCRIPTION

A1: Raw Material Supply

Production starts with acquiring needed raw materials. 'Raw material supply' also includes pre-treatment processes before the production. Main materials used in the production of PE pipes are high density polyethylene and masterbatch.

A2: Transport

Transport is relevant for delivery of raw materials and other materials to the plant and the transport of materials within the plant. The transport distances and routes are calculated based on the given information from the manufacturer for 2022.

A3: Manufacturing

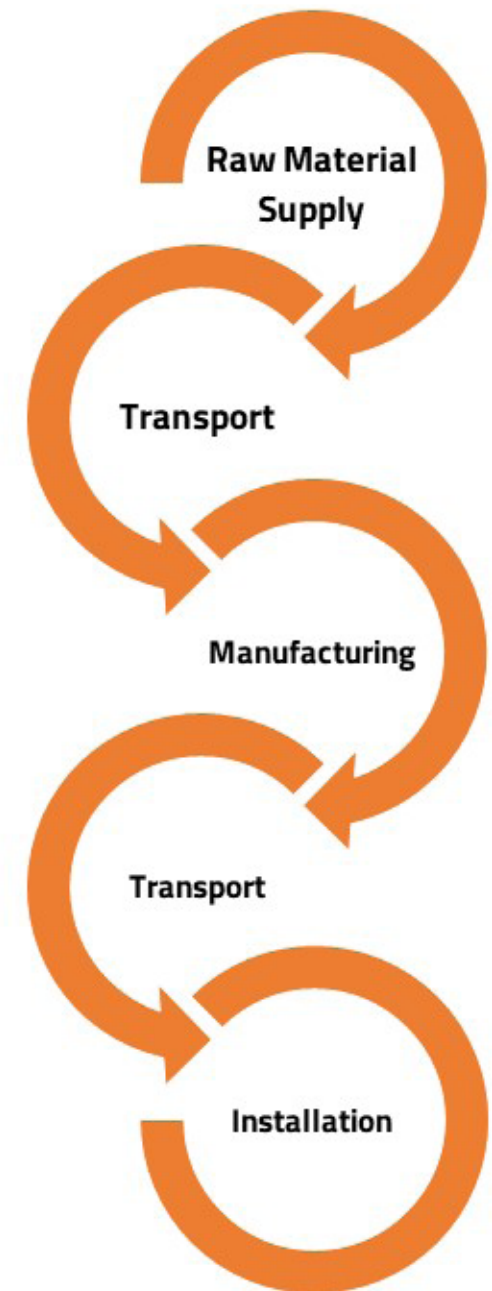
Following production processes are included: raw material + color masterbatch, mixing, vacuum feeding, raw material drying, single screw extruder, co-extruder, mold, calibrator, vacuum tank, cooling water, tank, inkjet printer, haul-off, cutter, and stacker.

A4: Transport

Transport of final product to customers are considered and the routes and distances are calculated accordingly. Transport routes were provided by the manufacturer for 2022.

A5: Construction installation

During the installation of the pipes to the underground, diesel equipments are used such as excavator/cranes. Based on a real case tracking, the impact of excavator/s use are included.



SYSTEM BOUNDARIES & DESCRIPTION

C1: Deconstruction/Demolition

During the removal of the pipes from the underground, diesel equipments are used such as excavator/cranes. Based on a real case tracking, the impact of excavator/s use are included.

C2: Transport

25 km distance is considered for the transport of final products to the waste processing area.

C3: Waste Processing

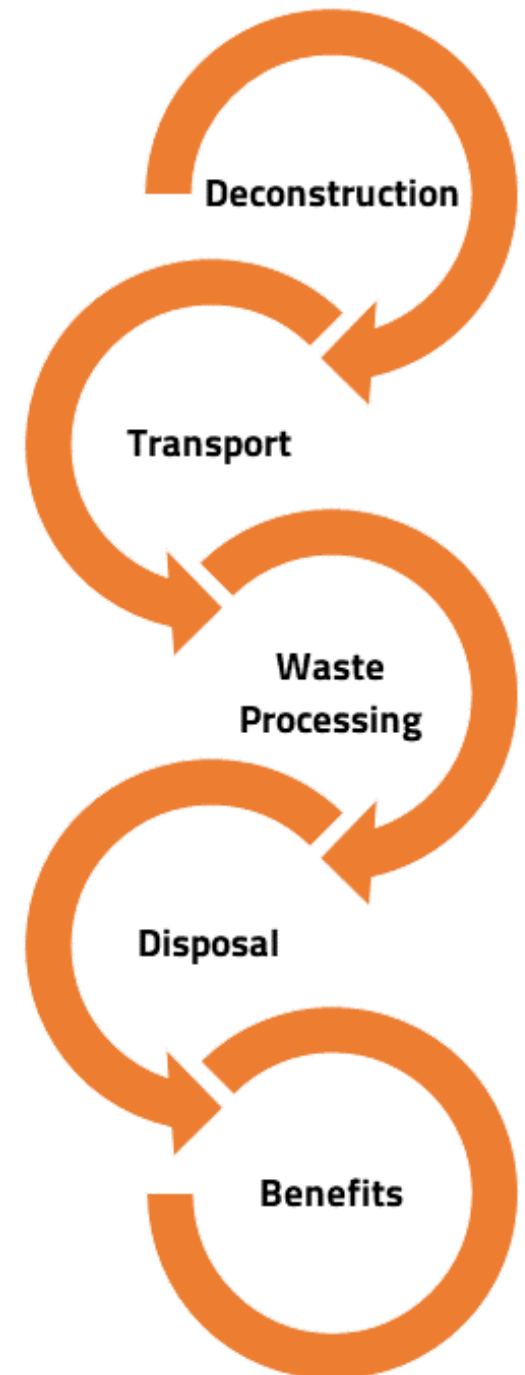
It is assumed that 3% of the product is lost during collection after reaching end-of-life. 60% of the rest is assumed to be incinerated with energy recovery and 30% of the rest is assumed to be recycled.

C4: Disposal

9.7% of the total product is assumed to be landfilled.

D: Future reuse, recycling or energy recovery potentials

The energy recovery in the form of heat from the incineration plant and the recycled PE content is considered as benefits in forms of energy recovery and raw material.



LCA INFORMATION

Declared Unit 1 kg Polyethylene Pressure Pipe

Time Representativeness 2022

Database(s) and LCA Software Ecoinvent 3.8 and SimaPro 9.3

System Boundaries Cradle to gate with options, modules C1–C4, module D and with optional modules (A4 and A5).

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits and Loads
	Raw Material Supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction / demolition	Transport	Waste Processing	Disposal	Future reuse, recycling or energy recovery potentials
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules Declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO	GLO	TR	GLO	GLO	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific Data Used	>90%	>90%	>90%	>90%	>90%	-	-	-	-	-	-	-	-	-	-	-	-
Variation - products	<10%					-	-	-	-	-	-	-	-	-	-	-	-
Variation - Sites	NR					-	-	-	-	-	-	-	-	-	-	-	-

(X = Included in LCA, NR= Not relevant, ND= Not declared)

LCA INFORMATION

The inventory for the LCA study is based on the 2022 production figures. This EPD's system boundary is cradle to gate with options, modules C1-C4, and module D. (A1–A3 + C + D and A4 and A5 modules).

Allocations

Water consumption, energy consumption and raw material transportation were weighted according to 2022 production figures. In addition, hazardous and nonhazardous waste amounts were also allocated from the 2022 total waste generation.

Cut-Off Criteria

1% cut-off is applied. Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts have been included.

REACH Regulation

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

LCA Modelling, Calculation and Data Quality

The results of the LCA with the indicators as per EPD requirement are given in the LCA result tables. All energy calculations were obtained using Cumulative Energy Demand (LHV) methodology, while fresh water use is calculated with selected inventory flows in SimaPro according to the PCR. There are no co-product allocations within the LCA study underlying this EPD. The regional energy datasets were used for all energy calculations.



LCA RESULTS

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - Fossil	kg CO ₂ eq	2.38E+00	1.77E-01	6.51E-01	3.21E+00	4.73E-02	3.73E-01	3.73E-01	4.07E-03	1.73E+00	1.44E-02	-1.56E+00
GWP - Biogenic	kg CO ₂ eq	4.93E-03	6.16E-05	6.64E-03	1.16E-02	9.24E-05	3.20E-04	3.20E-04	1.09E-05	4.47E-03	1.32E-05	-1.73E-03
GWP - Luluc	kg CO ₂ eq	8.84E-04	1.26E-04	4.73E-03	5.74E-03	1.84E-05	3.69E-05	3.69E-05	1.63E-06	3.81E-06	1.09E-06	-3.15E-04
GWP - Total	kg CO ₂ eq	2.39E+00	1.77E-01	6.63E-01	3.23E+00	4.74E-02	3.73E-01	3.73E-01	4.08E-03	1.73E+00	1.44E-02	-1.56E+00
ODP	kg CFC-11 eq	4.51E-08	3.57E-08	1.53E-08	9.60E-08	1.11E-08	7.90E-08	7.90E-08	9.43E-10	1.27E-09	3.11E-10	-1.04E-07
AP	mol H+ eq	9.61E-03	5.46E-03	4.27E-03	1.93E-02	1.54E-04	1.58E-03	1.58E-03	1.16E-05	1.94E-04	8.86E-06	-4.08E-03
*EP - Freshwater	kg P eq	4.27E-04	6.13E-06	6.73E-04	1.11E-03	3.57E-06	1.15E-05	1.15E-05	2.67E-07	1.92E-06	1.53E-07	-1.35E-04
EP - Marine	kg N eq	1.75E-03	1.34E-03	7.20E-04	3.81E-03	3.45E-05	5.76E-04	5.76E-04	2.35E-06	9.58E-05	4.64E-05	-8.17E-04
EP - Terrestrial	mol N eq	1.86E-02	1.49E-02	6.50E-03	4.00E-02	3.76E-04	6.32E-03	6.32E-03	2.56E-05	1.01E-03	3.28E-05	-8.71E-03
POCP	kg NMVOC	5.37E-03	3.63E-03	1.71E-03	1.07E-02	9.58E-05	1.55E-03	1.55E-03	6.64E-06	2.30E-04	1.12E-05	-2.50E-03
ADPE	kg Sb eq	1.47E-05	2.53E-07	8.94E-07	1.58E-05	1.13E-07	1.90E-07	1.90E-07	1.44E-08	3.62E-08	3.44E-09	-4.87E-06
ADPF	MJ	7.28E+01	2.30E+00	7.00E+00	8.21E+01	7.55E-01	5.07E+00	5.07E+00	6.17E-02	7.82E-02	2.43E-02	-3.48E+01
WDP	m ³ depriv.	9.59E-01	3.89E-03	2.38E-01	1.20E+00	2.81E-03	7.23E-03	7.23E-03	1.82E-04	2.51E-03	1.05E-03	-3.06E-01
PM	disease inc.	7.90E-08	5.94E-09	1.78E-08	1.03E-07	4.08E-09	1.97E-08	1.97E-08	2.58E-10	1.50E-09	1.70E-10	-2.66E-08
IR	kBq U-235 eq	5.59E-02	1.05E-02	5.61E-03	7.20E-02	3.55E-03	2.29E-02	2.29E-02	3.18E-04	3.89E-04	1.15E-04	-1.88E-02
ETP - FW	CTUe	2.79E+01	1.44E+00	6.85E+00	3.62E+01	6.32E-01	2.96E+00	2.96E+00	4.84E-02	4.24E-01	2.53E-02	-1.17E+01
HTTP - C	CTUh	7.37E-10	1.04E-10	1.22E-10	9.63E-10	1.62E-11	2.51E-10	2.51E-10	1.56E-12	2.10E-10	7.84E-13	-2.90E-10
HTTP - NC	CTUh	1.73E-08	9.77E-10	5.57E-09	2.39E-08	6.26E-10	1.61E-09	1.61E-09	4.88E-11	1.61E-09	1.51E-11	-7.03E-09
SQP	Pt	2.99E+00	4.90E-01	7.75E-01	4.26E+00	8.84E-01	6.62E-01	6.62E-01	4.46E-02	3.33E-02	5.95E-02	-1.41E+00
Acronyms	GWP-total: Climate change, GWP-fossil: Climate change- fossil, GWP-biogenic: Climate change - biogenic, GWP-luluc: Climate change - land use and transformation, ODP: Ozone layer depletion, AP: Acidification terrestrial and freshwater, EP-freshwater: Eutrophication freshwater, EP-marine: Eutrophication marine, EP-terrestrial: Eutrophication terrestrial, POCP: Photochemical oxidation, ADPE: Abiotic depletion - elements, ADPF: Abiotic depletion - fossil resources, WDP: Water scarcity, PM: Respiratory inorganics - particulate matter, IR: Ionising radiation, ETP-FW: Ecotoxicity freshwater, HTP-c: Cancer human health effects, HTP-nc: Non-cancer human health effects, SQP: Land use related impacts, soil quality.											
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A4: Transport, A5: Installation, C1: Deconstruction / demolition, C2: Transport, C3: Waste Processing, C4: Disposal, D: Future reuse. recycling or energy recovery potentials											
Disclaimer 1	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.											
Disclaimer 2	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.											

Resource use

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	9.44E-01	1.65E-02	1.51E+00	2.47E+00	8.35E-03	2.85E-02	2.85E-02	8.82E-04	4.44E-03	4.46E-04	-2.99E-01
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	9.44E-01	1.65E-02	1.51E+00	2.47E+00	8.35E-03	2.85E-02	2.85E-02	8.82E-04	4.44E-03	4.46E-04	-2.99E-01
PENRE	MJ	7.28E+01	2.30E+00	7.00E+00	8.21E+01	7.55E-01	5.07E+00	5.07E+00	6.17E-02	7.83E-02	2.43E-02	-3.48E+01
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	7.28E+01	2.30E+00	7.00E+00	8.21E+01	7.55E-01	5.07E+00	5.07E+00	6.17E-02	7.83E-02	2.43E-02	-3.48E+01
SM	kg	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	m ³	6.01E-03	2.29E-04	2.66E-03	8.90E-03	1.56E-04	4.46E-04	4.46E-04	1.03E-05	6.44E-04	2.72E-05	-4.00E-03
Acronyms	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy, PENRE: Use of non-renewable primary energy excluding 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, SM: Secondary material, RSF: Renewable secondary fuels, NRSF: Non-renewable secondary fuels, FW: Net use of fresh water.											

Waste & Output Flows

Impact Category	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	0	0	6.29E-05	6.29E-05	0	0	0	0	0	0	0
NHWD	kg	0	0	8.27E-02	8.27E-02	0	0	0	0	0	0	0
RWD	kg	0	0	0	0	0	0	0	0	0	0	0
CRU	kg	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0.291	0	0
MER	kg	0	0	0	0	0	0	0	0	0.582	0	0
EE (Electrical)	MJ	0	0	0	0	0	0	0	0	0	0	0
EE (Thermal)	MJ	0	0	0	0	0	0	0	0	0	0	0
Acronyms	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for reuse, MFR: Material for recycling, MER: Materials for energy recovery, EE (Electrical): Exported energy electrical, EE (Thermal): Exported energy, Thermal.											

Climate impact

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
*GHG-GWP	kg CO ₂ eq	2.30E+00	1.76E-01	6.51E-01	3.13E+00	4.70E-02	3.70E-01	3.70E-01	4.04E-03	1.72E+00	1.25E-02	-1.52E+00

GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology

* The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013

REFERENCES

GPI/ General Programme Instructions of the International EPD® System. Version 4.0.

EN ISO 9001/ Quality Management Systems - Requirements

EN ISO 14001/ Environmental Management Systems - Requirements

EN ISO 50001/ Energy Management Systems - Requirements

ISO 14020:2000/ Environmental Labels and Declarations — General principles

/EN 15804:2012+A2:2019/ Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products

ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures

ISO 14040/44/ DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework (ISO14040:2006) and Requirements and guidelines (ISO 14044:2006)

PCR 2019:14 Construction products (EN 15804:A2) (1.2.5) prepared by IVL Swedish Environmental Research Institute, EPD International Secretariat, date 2022-11-01.

The International EPD® System/ The International EPD® System is a programme for type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025. www.environdec.com

Ecoinvent / Ecoinvent Centre, www.ecoinvent.org

SimaPro/ SimaPro LCA Software, Pré Consultants, the Netherlands, www.pre-sustainability.com

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