Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Beam

from

PREbeton Zrt.

Programme:	The International EPD® System, www.environdec.com
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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

General information

Programme information

Programme:	The International EPD® System
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 v1.3.4, Construction products PCR 2019:14-c-PCR-003 Concrete and concrete elements (EN 16757) (2024-04-30)
PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Life Cycle Assessment (LCA)
LCA accountability: EY denkstatt Kft. LCA practitioners: Csongor Bajnóczki and Dominika Szűcs
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: Mari Kirss, Meetripuu OÜ Approved by: The International EPD® System
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 registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: PREbeton Zrt.

Contact: Postal address: 1037 Budapest, Bojtár u. 51.
Phone: +36 30 217 5588
Email: info@prebeton.hu

Description of the organisation:
As a member of Market Group, Prebeton Zrt. manufactures, assembles and processes prefabricated reinforced concrete structures. Its services include design, manufacturing, transportation, and assembly, enabling it to provide quality construction in a full range of structural projects. Its products have conformity marks, licenses and certificates according to Hungarian legislation. The company operates according to the MSZ EN ISO 9001 quality management system, thus ensuring consistently high quality.

Product-related or management system-related certifications:

- ISO 9001:2015
- ISO 14001:2015
- ISO 45001:2018

Name and location of production site(s):
Erdőtelek, Hungary

Product information

Product name, product identification, and product description:
Product name
Beam

Product description
The main, horizontal, load-bearing elements of buildings are beams and main supports. In terms of shape, they can be rectangular or profiled. In beam production, cost-effectiveness is important. Based on the loads and spans, soft iron and prestressed beam production is possible, which is determined by the static designer. By installation, we can talk about roof supports, intermediate slab beams and footbeams.

Beam
The beam product is made from reinforced steel, cement, sand, gravel, limestone and other additives. In the production of the beam products only non-renewable materials are used. Recycled material is used in the production of the beam products.

UN CPC code: 375

Geographical scope: Hungary

LCA information

Declared unit: 1 ton (1,000 kg)

Declared product: Beam product manufactured at Erdőtelek, Hungary

Reference service life: 50 years

Time representativeness: 2023-2024

Database(s) and LCA software used: Ecoinvent 3.10 (the EN 15804 reference package based on EF 3.1 has been used) and Microsoft Excel

Description of system boundaries: Cradle to gate with modules C1–C4 and module D (A1–A3 + C + D)

Energy in the manufacturing phase: Electricity information and CO_2 emission, kg CO_2-eq./kWh (GWP-GHG): 85,4%: electricity, high voltage, residual mix // HU, electricity, high voltage (Ecoinvent 3.10) + 14,6%: electricity production, photovoltaic, 3kWp slanted-roof installation, multi-Si, panel, mounted // HU, electricity, low voltage = 0,36 kg CO_2-eq./kWh.

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Manufacturing of product	Collected data	EPD owner	2023-2024	Primary	0,08%
Generation of electricity used in manufacturing of product	Database	Ecoinvent 3.10	2023-2024	Primary	1,54%
Materials	Collected data	EPD owner	2023-2024	Primary and generic representative data	41,08%
Transportation	Database	Ecoinvent 3.10	2023-2024	Primary	11,31%
Direct process emissions	Database	Ecoinvent 3.10	2023-2024	Primary	0,08%
Other processes	Database	Ecoinvent 3.10	2023-2024	Representative generic data	0%
Total share of primary data, of GWP-GHG results for A1-A3					**54,09%**

Manufacturing process:
Precast concrete production is an industrial process that allows the manufacturing and production of concrete elements (e.g. walls, columns, panels, beams, etc.) regardless of the location. Precast concrete elements are then placed on finished construction sites, which facilitate faster and more efficient construction.
Each production process starts with the design of a structurally dimensioned element for the construction of a pre-designed building. The process continues with the planning of the production and delivery schedules of the components to be constructed. A mould is required to produce each concrete product. The next step is the assembly of these moulds, which can be made of metal or wood. At the same time as the moulding process, the assembly of the reinforcing steel frame for the product begins. The finished armature and other necessary components are inserted into the already prepared frame and the entire structure is then filled with concrete. This gives the product its final shape.
Once the concrete has hardened, it is possible to dismantle the product and deposit it in a storage area. Prefabrication ideally precedes the on-site construction process, so that the manufacturer can provide temporary storage for the finished product. The delivery of the finished products will continue

according to the previously planned schedule until the building is fully completed. The elements delivered to the site are installed on site according to the completed plans.

More information: Detailed information on the products can be found at https://prebeton.hu/?l=en. The underlying LCA study was carried out by EY denkstatt Kft. (contact: eydenkstatt@hu.ey.com).

Data quality: ISO 14044 was applied in terms of data collection and quality requirements. The data concerning the modules A1 (raw material supply), A2 (transportation) and A3 (product manufacturing) were provided by PREbeton Zrt. and involved all input and output materials to the plant, the consumed utilities (energy, water) and the distances and means of transport for each input stream. Data reliability is considered very good for energy consumption, material inputs, material outputs, waste management and good for transportation. Proxy application was used in case of the cement input materials and two of the concrete additives.

Allocation: ISO 14040 defines the allocation as “partitioning the input or output flow of a unit process to the product system under study”. Allocation was done to identify the associated quantity of flows that are common for the factory: electricity and diesel consumption, product specific data: plywood, transportation of plywood, water usage, outputs: steel scrap, waste products generated during the manufacturing, inert waste material, mixed demolition waste, point source emissions.
Allocation is based on product volume, mass (kg), because there is a linear correlation between energy demand and weight mass of materials (product volume) and the inputs and outputs were provided in mass (kg).

Cut-off rules: According to the PCR and EN 15804, not more than 5% of the incoming flows (by mass and energy) per module can be excluded. Data is provided for all inputs and outputs to the factory processes, and they are accounted in the model in full. Materials and processes with negligible contributions (less than 1%) are also included. For processes after the production stage, relevant scenarios are assumed regarding geographical scope and existent practices, e.g., for waste treatment options. Where site-specific data was missing, it was modelled with generic datasets from the Ecoinvent 3.10 database. Construction of buildings, machines and other equipment or infrastructure and consumption related to offices are not included as they do not have a direct relation to the production process.

Calculating the primary energy use indicators: Based on different interpretations of EN 15804, the PCR 2019:14 v1.3.4 offers three options for how to separate the use of primary energy into energy used as raw material and energy used as energy carrier. Under the present study, option A has been selected. Option A is in direct connection to the declaration of the results of the primary energy use indicators in the EPD. Even though the energy used as raw materials is not zero over the product life cycle, energy is no longer stored in the product. The reason why energy used as raw materials is not zero over the product life cycle is because the energy stored in the packaging of the product enters under module A3 and leaves under module A5, however, module A5 is not declared in the present EPD.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x
Geography	EU	EU	HU	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	EU	EU	EU	EU	EU
Specific data used	54,09%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Content information per functional unit

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, kg C
Reinforced steel	81,3	7,133%	0
Locksmith material	14,4	0,002%	0
CEM I 52,5 N	57,1	0,000%	0
CEM I 52,5 R	94,9	0,000%	0
0-4 sand	146,6	0,000%	0
4-8 gravel	173,2	0,000%	0
8-16 gravel	169,8	0,000%	0
0-1 sand	101,6	0,000%	0
Dynamon HS 2020 IBC 1040 kg	2,6	0,000%	0,234
Viscostar 3K (1000 lit) 1030 kg	0,3	0,000%	0,027
OMYA Betacarb-ER (0-0,1) Limestone flour	80,3	0,000%	0
Water	63,3	0,000%	0
Reinforcing stabilizing wire	14,7	0,258%	0
TOTAL	1000	7,392%	0,261
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
N/A	N/A	N/A	N/A
TOTAL	N/A	N/A	N/A

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2.

Results of the environmental performance indicators

Results per functional or declared unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	2,71E+02	1,05E-01	6,99E-01	2,98E-01	1,20E-01	-1,61E-02
GWP-biogenic	kg CO_2 eq.	-9,09E-01	0,00E+00	0,00E+00	0,00E+00	9,09E-01	-5,56E-04
GWP-luluc	kg CO_2 eq.	2,37E-01	9,16E-06	2,29E-04	1,48E-04	6,25E-05	-6,94E-06
GWP-total	kg CO_2 eq.	2,70E+02	1,05E-01	6,99E-01	2,98E-01	1,03E+00	-1,67E-02
ODP	kg CFC 11 eq.	7,86E-06	1,61E-09	1,39E-08	5,88E-09	3,48E-09	-1,96E-10
AP	mol H^+ eq.	7,30E-01	9,51E-04	2,19E-03	2,16E-03	8,53E-04	-1,32E-04
EP-freshwater	kg P eq.	5,36E+01	3,07E-06	4,66E-05	1,09E-04	9,99E-06	-2,30E-06
EP-marine	kg N eq.	2,81E-01	4,41E-04	7,37E-04	8,13E-04	3,25E-04	-3,97E-05
EP-terrestrial	mol N eq.	2,06E+00	4,83E-03	8,01E-03	8,81E-03	3,55E-03	-5,40E-04
POCP	kg NMVOC eq.	6,34E-01	1,44E-03	3,42E-03	2,85E-03	1,27E-03	-1,34E-04
ADP-minerals&metals*	kg Sb eq.	3,99E+02	3,78E-08	2,28E-06	8,91E-07	1,91E-07	-2,39E-07
ADP-fossil*	MJ	2,26E+03	1,38E+00	9,81E+00	4,75E+00	2,95E+00	-2,21E-01
WDP*	m^3	3,99E+01	3,37E-03	4,74E-02	3,62E-02	8,25E-03	-7,49E-02
Acronyms	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						

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

*** Disclaimer: The information provided by modules A1-A3 is intended for informational purposes only. While these modules may yield valuable insights, it is crucial to consider the results from module C in conjunction with them.*

Additional mandatory and voluntary impact category indicators

Results per functional or declared unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	2,71E+02	1,05E-01	6,99E-01	2,98E-01	1,20E-01	-1,61E-02
PM[2]	Disease incidence	9,45E-02	2,06E-07	5,49E-08	2,26E-07	1,94E-08	-3,09E-09
IRP[3]	kBq U235 eq.	1,43E+01	6,17E-04	1,26E-02	2,29E-02	1,88E-03	-2,87E-03
Acronyms	GWP-GHG = Global Warming Potential greenhouse gases; PM = Particulate Matter emissions; IRP = Ionizing radiation, human health						

Resource use indicators

Results per functional or declared unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	2,11E+02	8,43E-03	1,66E-01	2,44E-01	2,74E-02	-7,72E-02
PERM	MJ	1,94E+02	0,00E+00	0,00E+00	-3,89E+01	-1,55E+02	0,00E+00
PERT	MJ	4,06E+02	8,43E-03	1,66E-01	-3,86E+01	-1,55E+02	-7,72E-02
PENRE	MJ	2,55E+03	1,38E+00	9,81E+00	4,75E+00	2,95E+00	-2,21E-01
PENRM	MJ	1,07E+02	0,00E+00	0,00E+00	-2,13E+01	-8,53E+01	0,00E+00
PENRT	MJ	2,66E+03	1,38E+00	9,81E+00	-1,66E+01	-8,24E+01	0,00E+00
SM	kg	7,39E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,10E+02
RSF	MJ	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
FW	m^3	3,99E+01	3,37E-03	4,74E-02	3,62E-02	8,25E-03	-7,49E-02
Acronyms	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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

[1] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.
[2] Already existing EPDs are applied for some materials, and many EPDs have excluded these indicators.
[3] Already existing EPDs are applied for some materials, and many EPDs have excluded these indicators.

Waste indicators

Results per functional or declared unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	3,03E+00	1,54E-03	1,41E-02	7,61E-03	3,28E-03	-1,58E-03
Non-hazardous waste disposed	kg	1,64E+02	2,10E-02	2,98E-01	1,52E+01	7,50E-02	-2,17E-02
Radioactive waste disposed	kg	2,89E-02	1,51E-07	3,13E-06	5,84E-06	4,59E-07	-6,35E-07

Output flow indicators

Results per functional or declared unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	0,00E+00	0,00E+00	0,00E+00	2,00E+02	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

References

Ecoinvent v3.10 database, 2023

EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products, 2019

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PCR 2019:14 v1.3.4, Construction products

PCR 2019:14-c-PCR-003 Concrete and concrete elements (EN 16757) (2024-04-30)

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