Pekabex

Environmental Product Declaration
Type III ITB No. 244/2021

Hollow cores

ITB is the verified member of The European Platform for EPD program operators and LCA practitioner
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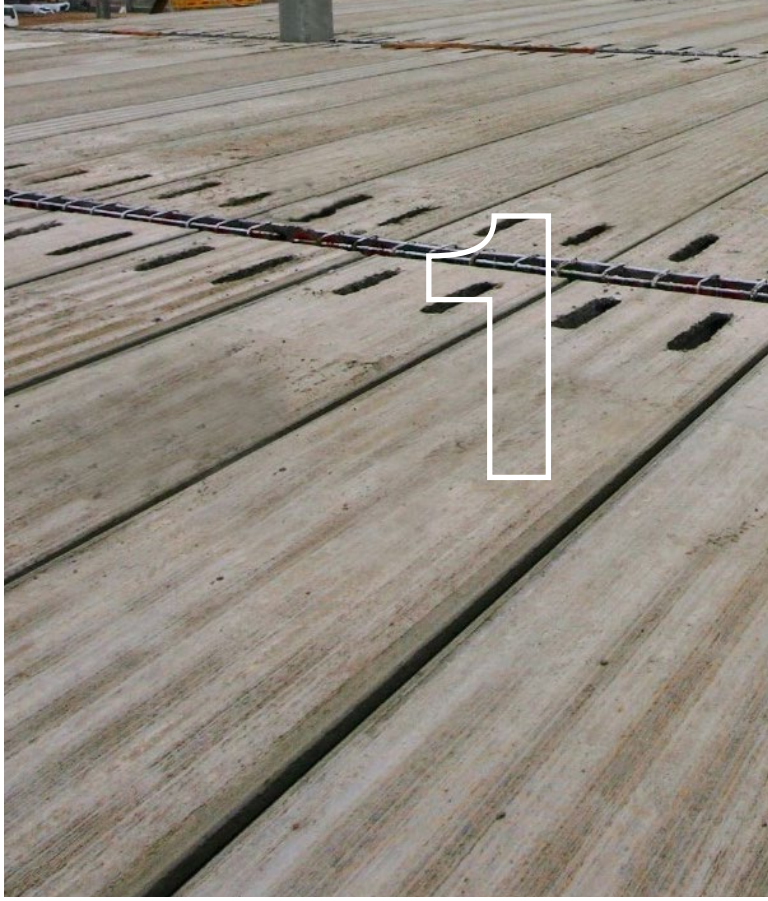
Basic Information



This declaration is the type III Environmental Product Declaration (EPD) based on EN 15804 and verified according to ISO 14025 by an external auditor.

It contains the information on the impacts of the declared construction materials on the environment. Their aspects were verified by the independent body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804 (see point 5.3 of the standard).

Life cycle analysis (LCA): A1-A3, C3, C4 and D modules in accordance with EN 15804 (Cradle-to-Gate with options)
The year of preparing the EPD: 2021
Product standard: PN-EN 1168+A3:2011, PN-EN 13369
Service Life: 50 years for standard products
PCR: ITB-PCR A (PCR based on EN 15804)
Declared unit: 1 ton
Reasons for performing LCA: B2B
Representativeness: Polish product

Manufacturer

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Pekabex S.A. is a manufacturer of prefabricated structures in Poland.

The company produces traditional reinforced elements, as well as modern prestressed elements used in enclosed structures (e.g. production and storage halls, offices, trade objects, railway stations, parking places), engineering objects (e.g. bridges, tunnels), and atypical designs. We offer wide range of standard products and realize special orders for individual designs. Pekabex S.A. possesses six production plants located in Poznań, Gdańsk, Bielsko-Biała, Mszczonów and Marktzeuln.

Fig 1. A view of Pekabex S.A. (Poland).

Product description and application

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Hollow cores are used for building construction. Elements can be produced in many variations: concrete class and exposure class, length and width, height from 100 to 500 mm, different fire resistance class etc.

Hollow cores are offered in the form of:

Prefabricated prestressed elements possess certificates of Zakładowa Kontrola Produkcji No. 1487-CPR-107/ZKP/15, 1487-CPR-108/ZKP/15, 1487-CPR-109/ZKP/15, 1487-CPR110/ZKP/15, 1487-CPR-111/ZKP/15 and Nordcert certificate No. 2215.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Allocation

The allocation rules used for this EPD are based on general ITB PCR A v. 1.5. Production of the hollow cores is a line process conduced in the manufacturing plan of Pekabex S.A. in Gdańsk (Poland).). All impacts from raw materials extraction and processing are allocated in module A1 of the LCA. Impacts from the global line production of PEKABEX S.A. were inventoried and were allocated to the production of the declared products based on the products mass basis. Water and energy consumption, associated emissions and generated wastes are allocated to module A3.

System limits

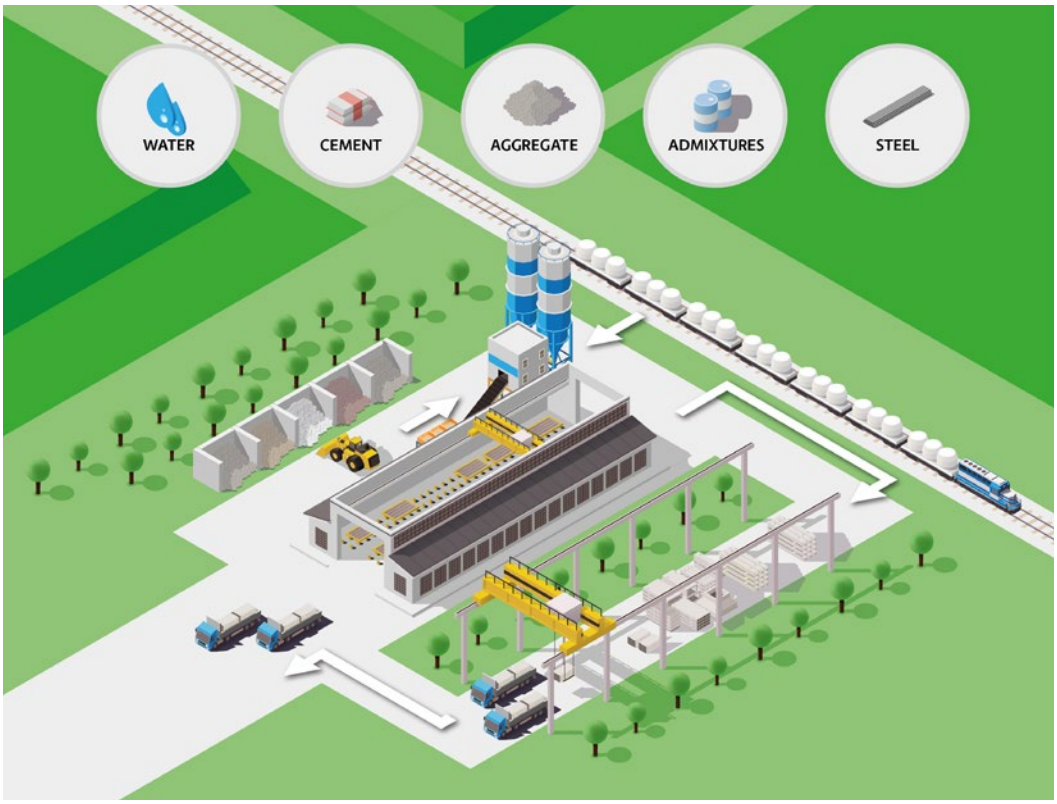
The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A3, end of life – modules C2-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) in accordance with EN 15804+A2 and ITB PCR A v.1.5. The details of systems limits are provided in product technical report. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

A1 and A2 Modules: Raw materials supply and transport

Raw materials such as sand, gravel, cement (CEM II), limestone, steel reinforcing components, additives and packaging materials come from both local and foreign suppliers. Means of transport include trains and lorries with loading capacity <10t and >16t. For calculation purposes Polish and European fuel averages were applied.

A3: Production

All of the components for precast production are coming to Pekabex by wheels deliveries or by train. Material for production is stored in designated for it places. Each of them is described in detail, exactly what material is to be there (e.g. aggregate entanglements, cement silos or designated zones for steel types, grades or diameters). Reinforcement elements are made partially automatically and manually. Ready reinforcement is placed in previously individually prepared forms. Concrete is poured into the prepared forms. . Ready elements are kept in the formwork until the minimum design parameters are achieved. After evacuation, each element is checked by the quality control department, and then taken to an external warehouse, and then directly to the customer for the construction site.



A scheme of manufacturing of the hollow core slabs by Pekabex BET S.A.

Modules C3, C4 and D: End of life

Hollow cores constitutes intermediate products. Versatile application of hollow cores excludes the possibility of precise modeling of the impacts occurring at the de-construction stage thus the module C1 is not declared within this EPD. In the adapted end-of-life scenario, the de-constructed products are transported to a waste processing plant distant by 90 km on > 16t lorry EURO 5, where undergo shredding with the use of crawler gear crusher equipped with magnetic separator (115 kW, electric drive) – module 3. Recovered materials undergo re-use, recycling and landfilling according to the Polish treatment practice of industrial wastes - Table 1. The remaining materials are classified as inert wastes in the European list of waste products and are forwarded to a landfill in the form of mixed construction and demolition wastes. Environmental impacts declared in module C4 are associated with exchanges to process-specific burdens. Module D presents potential credits resulting from the use of crushed concrete wastes as aggregates for road foundation or ballast and the recycling of the steel reinforcement. Module D presents credits resulting from the recycling of the primary steel scrap, calculated in accordance with the net scrap approach developed by World Steel Associated. Impacts of materials that constitute less than 1.0% of the total system flows were not taken into consideration.

Table 1. End-of-life scenario of hollow cores

Product	Material recover	Re-use	Recycling	Incineration	Landfilling
Concrete waste	100%	95%	0%	0%	5%
Steel	100%	0%	95%	0%	5%
Mineral wool	100%	0%	0%	0%	100%
Insulation foam	100%	0%	0%	100%	0%

Data collection period

Primary data provided by Pekabex S.A. covers a period form 01.01.2021 to 31.12.2021 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Data quality

The data used for LCA originate from ITB-LCI questionnaires completed by Pekabex S.A. using the data inventoried at manufacturing plant in Gdańsk, specific EPDs, ITB database and Ecoinvent v.3.8. No specific data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency are judged as good.

Assumptions and estimates

The impacts of the representative the hollow cores were aggregated using weighted average. Impacts were inventoried and calculated for all products manufactured by Pekabex S.A.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN15804+A2.

Databases

The data for the LCA calculation comes from specific EPDs, Ecoinvent v.3.8 and ITB Database. Specific data quality analysis was a part of an external audit.

LIFE CYCLE ASSESSMENT (LCA) – Results

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Declared unit

The declaration refers to declared unit (DU) – 1 tonne of the hollow core slabs manufactured by Pekabex S.A.

Table 2. System boundaries for the environmental characteristic the hollow core slabs.

Environmental assessment information (MNA – Module not assessed, MD – Module Declared, INA – Indicator Not Assessed)

Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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
MD	MD	MD	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MD	MD	MD

Hollow core slabs

Environmental impacts: (DU) 1 tonne

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Global warming potential	eq. kg CO2	1,01E+02	2,95E-01	1,40E+01	1,15E+02	6,26E-01	7,14E-01	2,01E-01	-1,18E+01
Greenhouse gas potential - fossil	eq. kg CO2	9,88E+01	2,93E-01	1,38E+01	1,13E+02	6,23E-01	7,01E-01	2,01E-01	-1,13E+01
Greenhouse gas potential - biogenic	eq. kg CO2	1,92E+00	1,19E-03	2,01E-01	2,12E+00	2,13E-03	1,26E-02	1,85E-04	-5,02E-01
Global warming potential - land use and land use change	eq. kg CO2	3,14E-02	1,38E-04	2,99E-03	3,45E-02	2,45E-04	1,65E-04	2,14E-05	-1,55E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	5,69E-06	6,59E-08	7,97E-07	6,56E-06	1,44E-07	1,34E-08	4,33E-08	-8,33E-07
Soil and water acidification potential	eq. mol H+	3,42E-01	1,17E-03	1,37E-01	4,80E-01	2,53E-03	7,42E-03	2,09E-03	-6,61E-02
Eutrophication potential - freshwater	eq. kg P	1,81E-02	2,30E-05	2,12E-02	3,94E-02	4,19E-05	1,27E-03	6,44E-06	-6,74E-03
Eutrophication potential - seawater	eq. kg N	8,54E-02	3,40E-04	1,95E-02	1,05E-01	7,64E-04	1,06E-03	9,25E-04	-1,50E-02
Eutrophication potential - terrestrial	eq. mol N	9,57E-01	3,71E-03	1,72E-01	1,13E+00	8,33E-03	9,05E-03	1,01E-02	-1,73E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	2,61E-01	1,14E-03	4,93E-02	3,12E-01	2,55E-03	2,54E-03	2,79E-03	-4,59E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1,75E-01	1,36E-06	1,74E-05	1,75E-01	2,21E-06	1,01E-06	1,05E-07	-8,78E-05
Abiotic depletion potential - fossil fuels	MJ	3,05E+02	4,30E+00	2,38E+02	5,47E+02	9,25E+00	1,14E+01	2,73E+00	-1,64E+02
Water deprivation potential	eq. m3	2,06E+01	2,25E-02	3,81E+00	2,45E+01	4,28E-02	2,32E-01	7,36E-03	-1,66E+01

Environmental aspects on resource use: (DU) 1 tonne

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
"Total consumption of renewable primary energy resources (primary energy AND primary energy resources used as raw materials)"	MJ	1,38E+02	7,38E-02	1,45E+01	1,53E+02	1,33E-01	8,29E-01	1,57E-02	-1,73E+01
"Consumption of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials"	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
"Total consumption of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)"	MJ	3,07E+02	4,30E+00	2,52E+02	5,63E+02	9,25E+00	1,21E+01	2,73E+00	-1,64E+02
Consumption of secondary materials	kg	8,89E+00	1,77E-03	1,80E-02	8,91E+00	3,10E-03	9,23E-04	1,06E-03	-7,11E+00
Consumption of renewable secondary fuels	MJ	2,79E+02	2,04E-05	1,02E-04	2,79E+02	3,42E-05	5,05E-06	3,68E-06	-1,51E-03
Consumption of non-renewable secondary fuels	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Net consumption of freshwater resources	m3	1,67E+00	6,04E-04	3,20E-01	1,99E+00	1,16E-03	3,72E-03	2,13E-04	-4,15E-01

Other environmental information describing waste categories: (DU) 1 tonne

Indicator	Unit	A1	A2	A3	A1-A3	C2	C3	C4	D
Hazardous waste, neutralized	kg	2,71E+00	5,59E-03	5,21E-01	3,23E+00	1,04E-02	2,37E-06	3,64E-03	6,22E-01
Non-hazardous waste, neutralised	kg	4,28E+01	1,01E-01	5,95E+00	4,88E+01	1,84E-01	6,75E-02	2,59E-02	-1,78E+01
Radioactive waste	kg	1,36E-03	2,93E-05	3,87E-04	1,78E-03	6,37E-05	9,82E-06	1,95E-05	-8,69E-04
Components for re-use	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
Materials for recycling	kg	2,26E+00	1,48E-05	3,07E+01	3,30E+01	2,86E-05	6,94E-05	3,67E-06	-1,15E-03
Materials for energy recovery	kg	1,13E-01	1,18E-07	2,58E-01	3,70E-01	2,32E-07	9,71E-08	5,83E-08	-1,00E-05
Energy exported	MJ	7,54E-01	5,23E-03	5,49E-01	1,31E+00	1,03E-02	3,32E-02	1,18E-02	-1,24E+00

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification. this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years. if the underlying data have not changed significantly.

The basis for LCA analysis was PN-EN 15804 and ITB PCR A

Independent verification corresponding to ISO 14025 (subclause 8.1.3.)

☒ external ☐ internal

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Verification of LCA: Ph.D. Eng. Michał Piasecki, m.piasecki@itb.pl

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006. Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011. Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A1:2013 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- KOBiZE Wskaźniki emisyjności CO2, SO2, NOx, CO i pyłu całkowitego dla energii elektrycznej. Grudzień 2021

Signature Not Verified
Dokument podpisany przez
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