



 **Pekabex**

Environmental Product Declaration
Type III ITB No. 774/2025

Stairs, balconies and docks manufactured on CEM I

Owner of the EPD

Pekabex BET S.A.
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ITB is the verified member of The European Platform for EPD program operators and LCA practitioner
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www.pekabex.pl

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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 13369, PN-EN 14843:2009, PN-EN 13225:2013

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



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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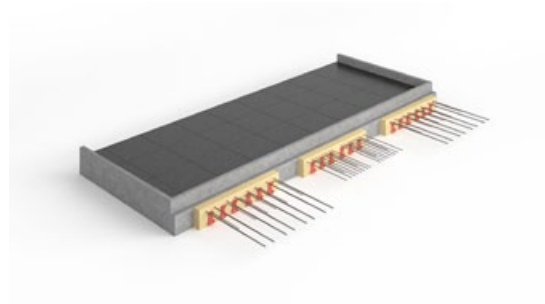
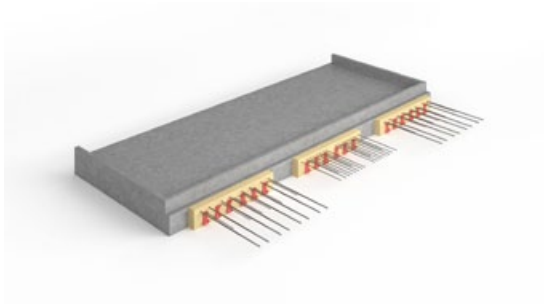
Prefabricated reinforced elements are used for building construction. Products, such as stairs, balconies and docks are available in various sizes, finishing options and shapes.

Prefabricated reinforced elements are offered in the form of:

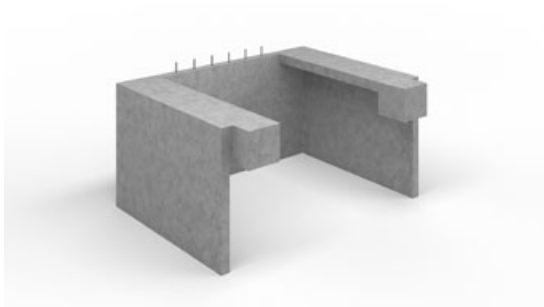
stairs



balconies



docks



Prefabricated reinforced 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. Production of the stairs, balconies and docks is a line process conducted 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 I), 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 stairs, balconies and docks by Pekabex BET S.A.

Modules C3, C4 and D: End of life

Stairs, balconies and docks constitutes intermediate products. Versatile application of stairs, balconies and docks 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 materi-

als 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 stairs, balconies and docks

| 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 from 01.01.2023 to 31.12.2023(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.3.10. 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 stairs, balconies and docks 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.3.10 and ITB Database. Specific data quality analysis was a part of an external audit.



LIFE CYCLE ASSESSMENT (LCA) – Results



Declared unit

The declaration refers to declared unit (DU) – 1 tonne of the stairs, balconies and docks manufactured on CEM I by Pekabex S.A.

Table 2. System boundaries for the environmental characteristic the stairs, balconies and docks.

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 | MD | MD | MD | MD |

Stairs, balconies and docks manufactured on CEM I

Environmental impacts: (DU) 1 tonne

| Indicator | Unit | A1 | A2 | A3 | A1-A3 | C2 | C3 | C4 | D |
|---|---------------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Global warming potential | eq. kg CO2 | 1,27E+02 | 9,12E+00 | 1,09E+01 | 1,47E+02 | 6,26E-01 | 7,14E-01 | 2,01E-01 | -1,18E+01 |
| Greenhouse gas potential - fossil | eq. kg CO2 | 1,29E+02 | 9,10E+00 | 1,09E+01 | 1,49E+02 | 6,23E-01 | 7,01E-01 | 2,01E-01 | -1,13E+01 |
| Greenhouse gas potential - biogenic | eq. kg CO2 | 5,83E-01 | 1,45E-02 | 2,45E-02 | 6,22E-01 | 2,13E-03 | 1,26E-02 | 1,85E-04 | -5,02E-01 |
| Global warming potential - land use and land use change | eq. kg CO2 | 3,68E-02 | 3,18E-03 | 1,27E-03 | 4,12E-02 | 2,45E-04 | 1,65E-04 | 2,14E-05 | -1,55E-02 |
| Stratospheric ozone depletion potential | eq. kg CFC 11 | 8,10E-06 | 1,79E-07 | 1,94E-07 | 8,47E-06 | 1,44E-07 | 1,34E-08 | 4,33E-08 | -8,33E-07 |
| Soil and water acidification potential | eq. mol H+ | 2,03E+01 | 2,87E-02 | 7,82E-02 | 2,04E+01 | 2,53E-03 | 7,42E-03 | 2,09E-03 | -6,61E-02 |
| Eutrophication potential - freshwater | eq. kg P | 1,70E-02 | 7,22E-04 | 1,22E-02 | 3,00E-02 | 4,19E-05 | 1,27E-03 | 6,44E-06 | -6,74E-03 |
| Eutrophication potential - seawater | eq. kg N | 9,13E-02 | 9,69E-03 | 1,16E-02 | 1,13E-01 | 7,64E-04 | 1,06E-03 | 9,25E-04 | -1,50E-02 |
| Eutrophication potential - terrestrial | eq. mol N | 1,48E+00 | 1,05E-01 | 1,03E-01 | 1,69E+00 | 8,33E-03 | 9,05E-03 | 1,01E-02 | -1,73E-01 |
| Potential for photochemical ozone synthesis | eq. kg NMVOC | 2,87E-01 | 4,46E-02 | 3,29E-02 | 3,64E-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 | 2,14E-01 | 2,97E-05 | 3,98E-06 | 2,14E-01 | 2,21E-06 | 1,01E-06 | 1,05E-07 | -8,78E-05 |
| Abiotic depletion potential - fossil fuels | MJ | 6,82E+02 | 1,28E+02 | 1,65E+02 | 9,75E+02 | 9,25E+00 | 1,14E+01 | 2,73E+00 | -1,64E+02 |
| Water deprivation potential | eq. m3 | 1,67E+01 | 6,38E-01 | 2,22E+00 | 1,95E+01 | 4,28E-02 | 2,32E-01 | 7,36E-03 | -1,66E+01 |

Additional impacts indicators: (DU) 1 tonne

| Indicator | Unit | A1-A3 | C1 - C4 | D |
|--|-------------------|-------|---------|-----|
| Particulate matter | disease incidence | INA | INA | INA |
| Potential human exposure efficiency relative to U235 | eg. kBq U235 | INA | INA | INA |
| Potential comparative toxic unit for ecosystems | CTUe | INA | INA | INA |
| Potential comparative toxic unit for humans (cancer effects) | CTUh | INA | INA | INA |
| Potential comparative toxic unit for humans (non-cancer effects) | CTUh | INA | INA | INA |
| Potential soil quality index | dimensionless | INA | INA | INA |

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 | 2,42E+01 | 2,49E+00 | 1,09E+01 | 3,75E+01 | 1,33E-01 | 8,29E-01 | 1,57E-02 | -1,73E+01 |
| Consumption of renewable primary energy resources used as raw materials | MJ | 1,32E+02 | 0,00E+00 | 0,00E+00 | 1,32E+02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| "Total consumption of renewable primary energy resources (primary energy AND primary energy resources used as raw materials)" | MJ | 2,92E+02 | 2,49E+00 | 1,09E+01 | 3,06E+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 | 3,48E+02 | 1,28E+02 | 1,65E+02 | 6,41E+02 | 9,25E+00 | 1,21E+01 | 2,73E+00 | -1,64E+02 |
| Consumption of non-renewable primary energy resources used as raw materials | MJ | 3,58E+02 | 0,00E+00 | 0,00E+00 | 3,58E+02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| "Total consumption of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)" | MJ | 7,06E+02 | 1,28E+02 | 1,65E+02 | 9,99E+02 | 9,25E+00 | 1,21E+01 | 2,73E+00 | -1,64E+02 |
| Consumption of secondary materials | kg | 7,42E+01 | 6,03E-02 | 1,71E-02 | 7,43E+01 | 3,10E-03 | 9,23E-04 | 1,06E-03 | -7,11E+00 |
| Consumption of renewable secondary fuels | MJ | 3,46E+02 | 7,34E-04 | 5,90E-05 | 3,46E+02 | 3,42E-05 | 5,05E-06 | 3,68E-06 | -1,51E-03 |
| Consumption of non-renewable secondary fuels | MJ | 1,66E+02 | 0,00E+00 | 0,00E+00 | 1,66E+02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

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

| Indicator | Unit | A1 | A2 | A3 | A1-A3 | C2 | C3 | C4 | D |
|----------------------------------|------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Hazardous waste, neutralized | kg | 4,37E-01 | 1,92E-01 | 1,29E+00 | 1,92E+00 | 1,04E-02 | 2,37E-06 | 3,64E-03 | -6,22E-01 |
| Non-hazardous waste, neutralised | kg | 2,48E+01 | 4,46E+00 | 5,93E+01 | 8,85E+01 | 1,84E-01 | 6,75E-02 | 2,59E-02 | -1,78E+01 |
| Radioactive waste | kg | 2,83E-03 | 4,65E-05 | 2,21E-05 | 2,90E-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 | 1,05E+01 | 1,01E-03 | 9,82E-04 | 1,05E+01 | 2,86E-05 | 6,94E-05 | 3,67E-06 | -1,15E-03 |
| Materials for energy recovery | kg | 1,22E-05 | 8,12E-06 | 1,95E-06 | 2,22E-05 | 2,32E-07 | 9,71E-08 | 5,83E-08 | -1,00E-05 |
| Energy exported | MJ | 8,27E-01 | 5,97E-02 | 9,03E-02 | 9,77E-01 | 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

External verification of EPD: PhD. Eng. Halina Prejzner

LCI audit and input data verification: M.Sc. Eng. Michał Chwedaczuk. m.chwedaczuk@itb.pl

LCA, LCI audit and input data verification: Ph.D., D.Sc., Eng. Michał Piasecki, m.piasecki@itb.pl

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the information provided and contained in EPD. Declarations of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL

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, NO_x, CO i pyłu całkowitego dla energii elektrycznej. December 2023

LCA, LCI, input data verification
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