

Reinforced concrete prefabricates



Issuance date: 07.01.2020
Validity date: 07.01.2025

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Manufacturer:

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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 external auditor. It contains the information on the impacts of declared construction materials on environment and their aspects 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: A1-A3 modules in accordance with EN 15804 (Cradle to Gate)

The year of preparing the EPD: 2019

Declared durability: Under normal conditions, prefabricated concrete elements are expected to last the service life of a building (50 years)

Product standard NS-EN 13369 - Common rules for precast concrete products

PCR: NS-EN 13369, PCR A (PCR based on EN 15804)

Declared unit: 1 m³ of precast concrete product

Reasons for performing LCA: B2B

Representativeness: Polish product

Manufacturer and Product Information

PB-M SCANBET Sp. z o.o. (Construction and Erection Company SCANBET Ltd.) was established in 1996. Since the very beginning the company has been dealing with the production of prefabricated reinforced concrete elements for residential, industry and engineering construction. The manufactured products are used in housing, industrial and engineering construction.

The manufacture does not produce standard elements; prefabricated elements are delivered for the needs of individual construction projects.

Application

SCANBET Ltd. specializes in production of concrete and reinforced concrete prefabricates ranging from walls, ceilings, stairs to balconies (weight up to 20 Mg, dimensions up to 10m). The present production capabilities include reinforced concrete prefabricates (not pre-stressed) in the approx. amount of 98,9 m³/day.

SCANBET reinforced concrete prefabricates produced in Chociwel factory cover 100% of whole factory production in analyzed period.

Diversity of reinforced concrete prefabricates produced in SCANBET:

BALCONIES AND LOGGIAS

Simply supported balconies produced in Chociwel factory do not need any insulation, cladding or concrete overlay after their assembling. There are different forms of balcony plates with diverse surfaces possible:

- smooth concrete surface
- anti-slippery surface
- surface prepared for tiling
- surface prepared for other systems

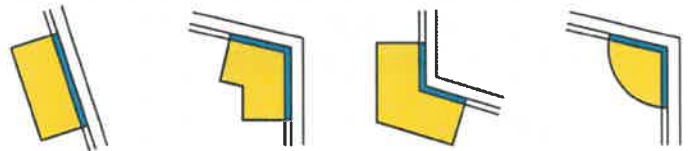


Figure. 1 Shapes for prefabricated concrete balconies and loggias from SCANBET

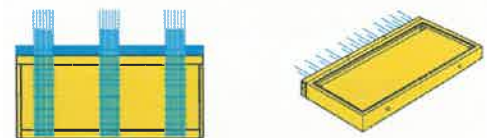


Figure. 2 Connection possibilities for balconies and loggias from SCANBET



REINFORCED CONCRETE WALLS AND FOUNDATIONS

Massive walls and sandwich walls with insulating layer of styrofoam, styrodur or mineral wool:

- outer surfaces of our walls can be homogenous or finished with different structures.
- prefabricated sandwich walls can have ready - made window or door openings.
- can be also equipped with electric installation, sanitary installation and accessories for connection the elements on the construction site.
- wide range of wall dimensions for residential buildings, public facilities, industry halls, etc



ELEMENTS OF CONCRETE STAIRCASES - Prefabricated flights of stairs

Production for individual clients and project-related manufacturing for big construction projects in all types of size and shape according to the needs of customer.

Specific production where steps and risers of the stairs receive smooth concrete surfaces (from the formwork surface), resulting with high visual quality of the steps; the underside of stairs is rubbed fine and smooth. The passable side of stairs can be tiled. There are a few possibilities how staircases can be produced:

- flight of stairs with a landing at the top & bottom.
- flights of stairs and landings produced separately
- stair runs supported on landings.
- spiral stairs 90° and 180 °.



ELEMENTS OF REINFORCED CONCRETE STRUCTURES

Prefabricated beams

Concrete beams of rectangular, trapezoid cross-sections, T-shaped, L-shaped beams with different dimension. The length of the beams is about 12m. The offered elements can be joined with the construction by means of placing on the columns support (using thorns, steel anchor plates) or by using screw connectors.

Prefabricated poles

Poles in specific sizes with square, rectangular and circular cross-sections. Their length can be fixed or variable. Poles are equipped with joining accessories (such as connectors, braces, steel anchor plates etc.). It is possible to produce poles with supports in all directions which serve as support for beams and joists.

Lift shafts

Lift shafts tailored to the needs of clients. The height of the elements depends on the height of each storey in a house. A lift shaft consists of the following elements:

- watertight shaft bottom
- bottom element*
- upper element*
- shaft top plate

**the upper and bottom storey elements can be produced as separate side walls; they can also be manufactured as one unit - as spatial element*



ENGINEERING PREFABRICATED ELEMENTS

Prefabricated L-shape, as well T-shaped retaining walls with symmetrical or asymmetrical footing.

Their aim is to transfer the pressure of a secured construction and are used when building ramps, channels and tunnels.





In SCANBET quality control is carried out on the basis of the Factory Quality Control System. It consists in controlling operations on every stage of production. System of Quality Control was accepted by Norwegian certification authority "Kontrollradet". The mentioned authority granted the company SCANBET the Certification of Factory Quality Control System No. 1111-CPD-0408 which applies to compliance with the following standards:

- NS-EN 13225:2004 Precast Concrete Elements: Bar-shaped construction elements.
- NS-ES 14843:2005 + A1:2008 Precast Concrete Elements. Concrete Ceiling Plates for Composite Systems.
- NS-EN 14843:2007 Precast Concrete Elements: Stairs.
- NS-EN 1992:2007 Precast Concrete Elements: Walls.

Certificate No. PROD – 050 granted by Certification Authority Kontrollradet confirms that a company established and implemented its production system for precast reinforced concrete elements according to the Standards NS-EN 13369:2001 – Common Requirements for Precast Concrete Elements.

The Production Control System of the company SCANBET fulfils also the requirements of the standards confirmed by Certificate of Conformity (Übereinstimmungszertifikat) granted by Brandenburgische Technische Universität Cottbus:

- DIN EN 206-1:2001-07
- DIN 1045-1-3 2008-08
- DIN 1045-4:2001-7.

SCANBET is also accredited by Swedish Association of Certification System with Certificate No. 2113, which confirms the compatibility with the series of standards EN 13369, BKR and BBK as well as compatibility with BBC' certification rules.

The above certificates authorize SCANBET to sell prefabricated elements in the European Union and Norway using the CE mark.

SCANBET is also labelled with BVB (Byggvarubedömningen) mark. The BVB quality mark aims to assess the quality of building materials used in the construction process and to promote product development towards a non-toxic and good environment.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Allocation

The allocation rules used for this EPD are based on general ITB-PCR A and EN 13369. The prefabricated concrete elements production is a line process with multiple co-products located in one factory based in Chociwel.

All impacts from raw materials extraction are allocated in A1 module of EPD. 100% of impacts from line production were inventoried and allocated to whole prefabricated concrete elements production. Municipal waste and waste water of whole factory were allocated to module A3. Electricity was inventoried for whole production process. Emissions are measured separately as well and presented in A3 module.

System limits

The life cycle analysis of the examined products covers "Product Stage", A1-A3 modules (Cradle to Gate) in accordance with EN 15804+A1 and ITB-PCR A. Details on systems limits are provided in product specific report. All materials and energy consumption inventoried in factory were included in calculation. Office impacts were also taken into consideration. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation, utilised thermal energy, internal fuel and electric power consumption, direct production waste, and all available emission measurements. This study also takes into account some material flows of less than 1% and energy flows with a proportion of less than 1%. It can be assumed that the total sum of omitted processes does not exceed 1% of all impact categories. In accordance with EN 15804, machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

A1 and A2 Modules: Raw materials supply and transport

A1 module includes raw materials used in production of prefabricated concrete elements. Crucial products are – cement CEM I 52,5 R, aggregates, reinforcing bars and meshes and concrete additives which accounts for 95% of total sum of raw materials. Raw materials for prefabricated concrete elements production come from local suppliers and from more distant locations. Data on transport of the different products to the manufacturing plants is collected and modelled for factory by assessor. Means of transport to the factory includes trucks with capacity of 1-26 tonnes and Polish and European fuel averages are applied.

A3: Production

The figure 3 show the working process during the production of prefabricated concrete elements. The raw materials: aggregates, cement, cement additives, steel and other inserts (e.g. EPS insulation) and water are distributed to forms made of wood and plywood, which is reused as energy carrier for heat production. Prefabricated elements are stored in forms until concrete reaches its utility parameters. The 221,94 kg of waste from every functional unit (1 m³ of precast concrete element) is being recycled. Ready-to-use prefabricated elements are packed and distributed.

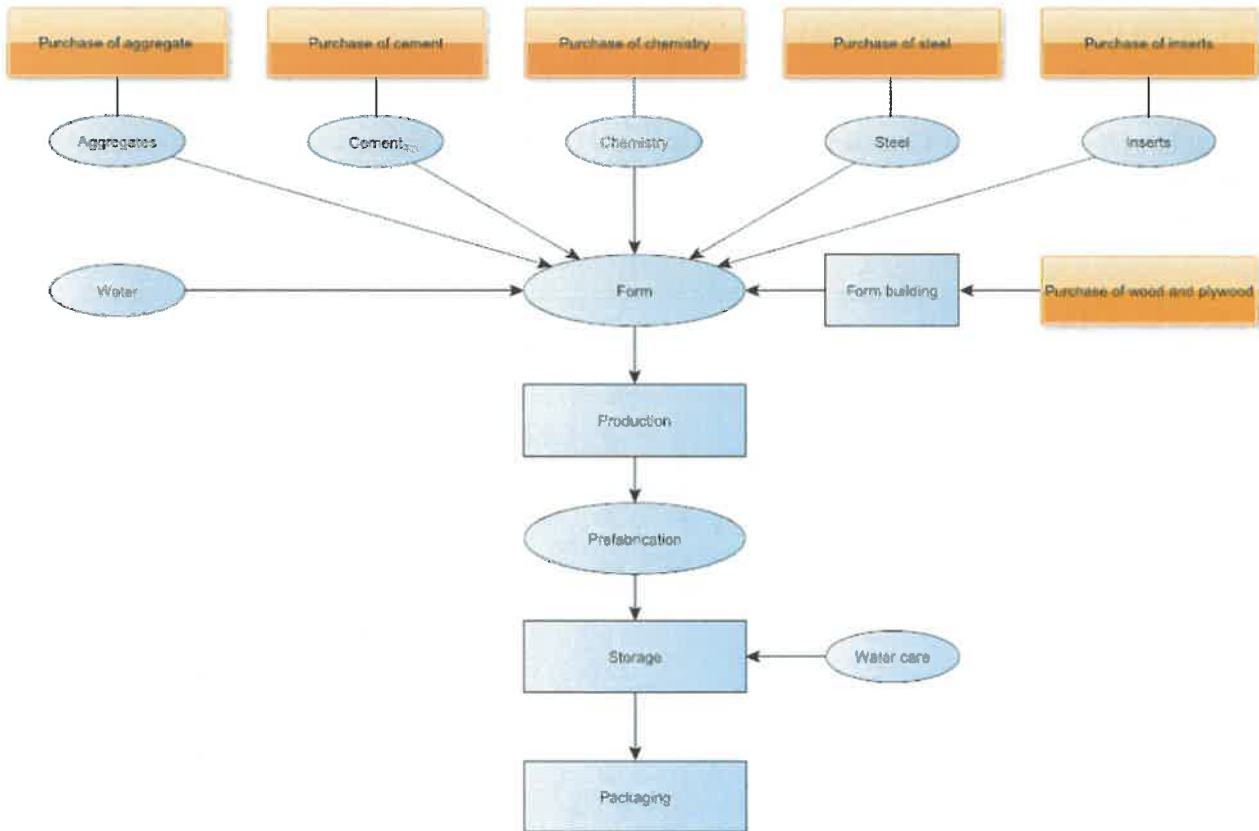


Figure. 3 Production scheme for prefabricated concrete elements from SCANBET

Data collection period

The data for manufacture of the examined products refer to period between dates 01.01.2018-31.12.2018. The life cycle assessments were prepared for locations in Poland as reference area.

Data quality

The values determined to calculate the LCA originate from verified PB-M SCANBET Sp. z o.o inventory data.

Assumptions and estimates

The impacts of the representative SCANBET products for each prefabricated element were aggregated using weighted average. The weighted average method was used according to the percentage of each product in prefabricated element based on the relation to whole production quantity. Impacts were inventoried and calculated for all products in prefabricated concrete element product group.

Calculation rules

LCA was done in accordance to PCRA and EN 13369:2001 document.

Databases

The data for the processes come from the following databases: Ecoinvent, Ullmann’s, ITB-Data. Specific data quality analysis was a part of external ISO 14001 audit. Characterization factors are CML ver. 4.2 based on EN 15804:2012+A2:2019 version.

LIFE CYCLE ASSESSMENT (LCA) - Results

Declared unit

The declaration refers to functional unit (DU) – 1 m³ tonne of reinforced concrete prefabricates manufactured in Chociwel.

Table 2. System boundaries for environmental characteristic for SCANBET prefabricated elements

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-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	MNA	MNA	MNA

SCANBET prefabricated concrete elements manufactured in Chociwel

Environmental impacts: (DU – 1 m ³)					
Indicator	Unit	A1	A2	A3	A1-A3
Global warming potential	[kg CO ₂ eq.] (100 years)	738,64	12,71	45,03	796,38
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	7,22E-06	0	0	7,22E-06
Acidification potential of soil and water	[kg SO ₂ eq.]	1,93	1,25E-02	6,09E-02	2,00
Formation potential of tropospheric ozone	[kg Ethene eq.]	2,74E-01	5,24E-03	0	2,79E-01
Eutrophication potential	[kg (PO ₄) ³⁻ eq.]	3,21E-01	1,56E-03	3,60E-03	3,26E-01
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	0,13	0	1,67E-04	1,26E-01
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	5889,06	123,28	464,71	6477,05
Environmental aspects on resource use: (DU – 1 m ³)					
Indicator	Unit				
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	1,49E-01	1,46E+01	14,75
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	1,84E+02	184,04
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	1016,50	1,49E-01	198,64	1215,29
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	6043,23	135,61	511,18	6690,02
Use of secondary material	[kg]	238,46	0,00	0,00	238,46
Use of renewable secondary fuels	[MJ]	INA	INA	184,04	184,04
Use of non-renewable secondary fuels	[MJ]	INA	INA	INA	INA
Net use of fresh water	[dm ³]	INA	INA	INA	INA
Other environmental information describing waste categories: (DU – 1 m ³)					
Indicator	Unit	A1	A2	A3	A1-A3
Hazardous waste disposed	[kg]	1,17E-01	0	0	1,17E-01
Non-hazardous waste disposed	[kg]	86,02	4,84	12,76	103,63
Radioactive waste disposed	[kg]	0	0	0	0
Components for re-use	[kg]	0	0	0	0
Materials for recycling	[kg]	0	0	221,94	221,94
Materials for energy recovery	[kg]	0	0	0	0
Exported energy	[MJ]	0	0	0	0

Verification

The process of verification of this EPD is in accordance with EN 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 EN 15804 and ITB PCR A and EN 16783
Independent verification corresponding to ISO 14025 (subclause 8.1.3)
<input checked="" type="checkbox"/> external <input type="checkbox"/> internal
External verification of EPD: PhD. Eng. Halina Prejzner
LCA, LCI audit and input data verification: M.Sc. Eng. Dominik Bekierski, d.bekierski@itb.pl
Verification of LCA: PhD Eng. Michał Piasecki, m.piasecki@itb.pl

Normative references

- ITB PCR A- General Product Category Rules for Construction Products
- NS-EN 13369 - Common rules for precast concrete 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+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- EN 15942:2011 Sustainability of construction works - Environmental product declarations - Communication format business-to-business



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