ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*

Owner of the Declaration	thomas gruppe - Geschäftsfeld Betonbauteile
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-THO-20200087-IBD1-EN
Issue date	24.08.2020
Valid to	23.08.2025

Floor plates
thomas betonbauteile

Institut Bauen und Umwelt e.V.

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1. General Information

thomas betonbauteile	Floor plates
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** thomas gruppe - Geschäftsfeld Betonbauteile thomas beteiligungen GmbH Im Industriepark 13 55469 Simmern
Declaration number EPD-THO-20200087-IBD1-EN	**Declared product / declared unit** 1 t Floor plates
This declaration is based on the product category rules: Pre-cast concrete components, 07.2014 (PCR checked and approved by the SVR)	**Scope:** This document refers to Floor plates of the concrete components business area of the thomas group, produced in 1 out of 29 locatios: **thomas betonbauteile Rostock GmbH** Werkstr. 8 18069 Rostock
Issue date 24.08.2020	The declared unit is 1 t of floor plates. The data for the production of the declared product was collected on a plant-specific basis with current annual data from 2018. The declarant is responsible for the underlying data and their verification.
Valid to 23.08.2025	The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences. The EPD was created according to the specifications of *EN 15804+A1*. In the following, the standard will be simplified as *EN 15804*.
	Verification The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2010* ☐ internally ☒ externally
Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	
Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	Angela Schindler (Independent verifier appointed by SVR)

2. Product

2.1 Product description/Product definition

Floor plates are manufactured in the automatic circulation systems of the precasted concrete plants. Floor plates consist of prefabricated reinforced concrete slabs and are supplemented by in-situ concrete. They are used as ceiling elements in prefabricated buildings and differ in their size.

For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a declaration of performance taking into consideration *EN 13747, 2010,* Precast concrete products - Floor plates for floor systems, and the CE-marking. For the application and use the respective national provisions apply.

2.2 Application

Floor plates of the thomas group from the concrete components business area are used in prefabricated buildings. They are applicable as load-bearing ceilings, storey ceilings of buildings, parking and traffic areas as well as covers.

2.3 Technical Data

The following technical data apply to floor plates. The standard *EN 13747:2010,* applies.

Constructional data

Name	Value	Unit
Concrete Compressive Strength	fck ≥ C25/30	
Tensile strength reinforcing steel	ftk = 550	N/mm²
Prestressing steel stress	fpk	N/mm²
Yield strength of reinforcing steel	fyk = 500	N/mm²
0.1% yield strength prestressing steel	Fp0,1 k	N/mm²
Mechanical consistence	measurement specification, harmonized acc. to EN 13747:2005 + AC:2006	
Fire resistance (for the load capacity)	measurement specification, harmonized acc. to EN 13747:2005 + AC:2006	
Corrsosion resistance	measurement specification, harmonized acc. to EN 13747:2005 + AC:2006	
Gross density	2.533	t/m³

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN 13747,* 2010, Precast concrete products - Floor plates for floor systems.

2.4 Delivery status

For safety reasons and to avoid damage during transport floor plates can be loaded on pallets. The dimensions of the floor plates are:

- Width: up to 2,5 m
- Length up to 9 m
- Thickness: up to 8 cm

2.5 Base materials/Ancillary materials

The main constituents of floor plates are:

- Cement: ca. 15 M.-%
- Ingredients: 75 - 80 M.-%
- Steel: < 5 M.-%
- Water: 6 M.-%

This product or at least one partial article contains substances listed in the candidate list (27.06.2018) exceeding 0.1 percentage by mass: no.

This product or at least one partial article contains other CMR substances in categories 1A or 1B which are not on the ECHA candidate list, exceeding 0.1 percentage by mass: no.

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no.

2.6 Manufacture

Shaping

The preliminary products such as aggregates, cement and reinforced steel for the floor plates are delivered. The concrete is mixed together according to predefined recipes. Before casting the floor plates, the formwork is created with the desired dimensions. The reinforcing bars for the reinforced concrete slabs are attached and then filled with concrete.

Curing and Outplacement

The floor plates are cured for 8-10 hours in drying chambers. After curing, they can be removed and can be loaded. The standard strength is reached after 28 days after production.

2.7 Environment and health during manufacturing

Throughout the manufacturing process, additional measures for health safety - exceeding the legal measures for occupational safety for business enterprises - are not required.
Hazards to water, air and soil can be excluded if the product is used as intended. Corresponding to the intended use of the construction products, no health impairments are known due to the raw materials used.At the manufacturing location, certificates of the environmental management systems *EN 14001 exist.*

2.8 Product processing/Installation

For the installation, the generally valid laying instructions of the *Fachvereinigung Betonbauteile mit Gitterträgern* (Association for concrete components with lattice girders) for floor plates must be observed. Floor plates are unloaded from the truck with the construction site crane or mobile crane and laid within the same operation.

2.9 Packaging

Floor plates are stacked and ransported to the construction site by truck. For protection against damanges, stacking wood is placed between the panels.

2.10 Condition of use

The floor plates are durable construction materials. The material composition does not change during service life.

2.11 Environment and health during use

There are no known interactions between the product, the environment and health. Hazards for air and soil can be excluded if the described products are used as intended.

2.12 Reference service life

Based on the useful lives of building components according to the Sustainable Building Assessment System *BBSR*, Service Lives of components for life cycle assessment according to Assessment System for

Sustainable Building (BNB), the reference service life of metal ceilings exceeds 50 years.

2.13 Extraordinary effects

Fire

Floor plates declared here correspond to the class A1 of building products regarding their fire performance, according to *EN 13501-1*.

Fire protection

Name	Value
Building material class	A1
Burning droplets	-
Smoke gas development	-

Water
There are no known effects on the environment in the event of unforeseen ingress of water.

Mechanical destruction
In the case of mechanical destruction, floor plates may break.

2.14 Re-use phase
Individual components of floor plates, such as concrete and steel, can be re-used after varietal segregation. Concrete can be ground and used as an additive in the production of building materials as a secondary raw material input, e.g. as filler and fill material in civil engineering, road construction or e.g. for noise barriers.
The steel scrap is collected and sent either directly or via the scrap metal trade to secondary smelting companies. Floor plates can be refurbished to new building products with comparatively little effort and energy.

2.15 Disposal
Remains of floor plates and those from demolition occurring on the construction site, can be disposed of in accordance with the local regulations or Waste Classification Ordinance
(AVV) and *the European Waste Catalogue (EWC).* The disposal code is 17 01 01 (concrete), if the recycling options mentioned above are not practical.

2.16 Further information
Processing instructions, product data sheets, safety information and other technical information are available for download on the website of the thomas group:
www.thomas-gruppe.de

3. LCA: Calculation rules

3.1 Declared Unit
The declaration applies to 1 t of floor plates.
Floor plates vary in volume, mass and slightly in composition. The average calculation is based on the average annual production.

Declared unit

Name	Value	Unit
Declared unit	1	t
Grammage	0.128	t/m²
Density	2533	t/m³

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3.2 System boundary
The Life Cycle Assessment considers the system boundaries "cradle to grave" and follows the modular construction system described by *EN 15804*. The LCA takes into account the following
modules:

- A1: Raw material supply: extraction of raw material, production of precursors, processing of cement and aggregates, steel production, casting and processing of recycling materials
- A2: Transport of precursors: transport of raw materials to manufacturing plant
- A3: Manufacturing: production of floor plates
- C1: De-Construction & Demolition of floor plates
- C2: Transportation towards disposal
- C4: Disposal of floor plates

3.3 Estimates and assumptions
Plant and process specific data was provided for the Life Cycle Assessment. Missing information on primary data regarding transport distances were suplemented by estimates based on a medium transport distance of 300 km in Germany.

3.4 Cut-off criteria
All relevant data, i.e. all applied materials according to the recipe and the energy used originate from the production data acquisition and have been considered within the inventory analysis. Material- and energyflows with a proportion of less than 1 % were collected. It can be assumed, that the sum of the neglected processes does not exceed 5 % of the impact categories.

3.5 Background data
Primary data has been provided by the manufacturer. All background data required for the Life Cycle Assessment originates form the database *ÖKOBAUDAT 2019-III*. Individual flows were complemented by *ecoinvent 3.6* and *GaBi ts 7.3.3*.

3.6 Data quality
The Life Cycle Assessment was essentially calculated based on result from impact assessments of upstream activities. This leads to limitations on delared indicators (SM) and modules C3 and D.
For modelling the Life Cycle of floor plates, data has been from the production year 2018. Background data has been taken from the various database. For the Life Cycle Inventory all input and output flows have been respected.

3.7 Period under review
The amount of raw materials, input energy and the volume of waste relate to the year 2018. It corresponds to the best currently available technology and thus is representative for the considered time period. The reference area is Germany.

3.8 Allocation
Co-product allocation does not exist in the manufacturing process.

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

The background data was used from various LCA database. Thereby limitations on comparability of EPDs may result.
The LCA background database *ÖKOBAUDAT 2019-III* was used. Individual flows were complemented by *ecoinvent 3.6* and *GaBi ts 7.3.3* .

4. LCA: Scenarios and additional technical information

The following technical information models the basisfor the declared modules or can be used for developing specific scenarios within the context of a building assessment.

The reference life span according to *ISO 15686-1* could not have been determined. The declaration of the reference life span underlies the assessment system of the Federal Institute for Research on Building, Urban Affairs and Spatial Development *BBSR*.

Reference service life

Name	Value	Unit
Reference service life (according to ISO 15686-1, -2, -7 and -8)	-	a
Life Span (according to BBSR)	≥ 50	a

End of life (C1-C4)

Name	Value	Unit
Landfilling	970	kg
Recycling	30	kg

5. LCA: Results

The table displayed below summarizes the results of the Life Cycle Assessment (LCA). The results of the impact assessment do not provide any information on endpoints of the impact categories, exceedances of thresholds, safety margins or risks. The results refer to the declared unit of 1 t floor plates. The Impact Assessment is based on /CML 2001/ - April 2015. The Impact Assessment is based on CML 2001 - April 2015.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction 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**
X	X	X	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	X	X	MND	X	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 t floor plates

Parameter	Unit	A1-A3	C1	C2	C4
Global warming potential	[kg CO_2-Eq.]	1.64E+2	8.63E-1	1.92E+0	1.44E+1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.16E-7	2.84E-16	9.11E-16	8.47E-14
Acidification potential of land and water	[kg SO_2-Eq.]	1.89E-1	6.06E-4	4.33E-3	8.65E-2
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	4.59E-2	8.69E-5	1.06E-3	9.81E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.92E-2	9.06E-5	-1.34E-3	6.64E-3
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.35E-4	3.02E-8	1.86E-7	5.32E-6
Abiotic depletion potential for fossil resources	[MJ]	9.26E+2	1.18E+1	2.57E+1	2.02E+2

RESULTS OF THE LCA - RESOURCE USE according to EN 15804+A1: 1 t floor plates

Parameter	Unit	A1-A3	C1	C2	C4
Renewable primary energy as energy carrier	[MJ]	2.22E+2	5.35E-2	1.61E+0	2.66E+1
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	2.22E+2	5.35E-2	1.61E+0	2.66E+1
Non-renewable primary energy as energy carrier	[MJ]	1.01E+3	1.19E+1	2.58E+1	2.09E+2
Non-renewable primary energy as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	1.01E+3	1.19E+1	2.58E+1	2.09E+2
Use of secondary material	[kg]	IND	0.00E+0	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m^3]	3.60E-1	8.45E-5	1.82E-3	5.26E-2

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES according to EN 15804+A1: 1 t floor plates

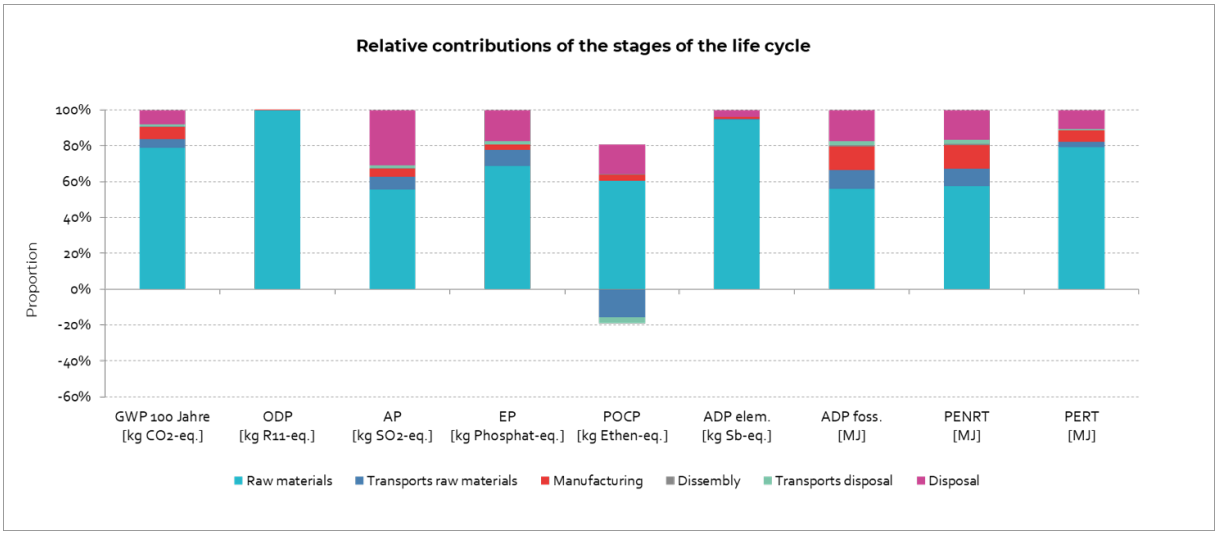
Parameter	Unit	A1-A3	C1	C2	C4
Hazardous waste disposed	[kg]	3.35E-3	1.69E-9	1.46E-6	3.56E-6
Non-hazardous waste disposed	[kg]	2.58E+1	1.51E-3	1.83E-3	9.71E+2
Radioactive waste disposed	[kg]	3.04E-2	1.18E-5	3.90E-5	2.77E-3
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	2.28E-1	0.00E+0	3.00E+1	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0

* MND: Modul not declared

6. LCA: Interpretation

The following figure shows the relative contributions of different Life Cycle processes and the primary energy demand in the form of a dominance analysis.

The Life Cycle Assessment was essentially calculated based on result from impact assessments of upstream activities. This leads to limitations on delared indicators (SM) and modules C3 and D.
Deviations in the material composition within the product may occur. The influence on the range of the environmental impact is determined by the proportion of the reinforcing steel in the product. The product considered in the model has a share of reinforcement steel of 0.030 M% and has a greenhouse gas potential (GWP) of 164 kgCO2e within production (A1–3). The proportion of reinforcement steel can vary in individual cases (0.022 - 0.033 M%) and cause a range ofthe greenhouse gas potential (GWP) within production (A1–3) of -1 % to +3 %.
Unless otherwise stated, the fluctuations in all other impact categories are also small (<10 %).



Indicators of the impact assessment

The impact categories are determined throughout the life cycle mostly by module A1 (raw materials). The main driver is the use of cement, which contributes about to 72 % to the greenhouse gas potential (GWP) in the production stage (A1–A3), followed by steel with 13 %. Contributions to the environmental impact from the transport of the preliminary products (according to the assumed scenario for A2) and the energy input for production (A3) within the production stage are comparable small. For the disposal of the construction waste (C1–C4) additional environmental burden occurs.

Global warming potential (GWP)
The global warming potential is mainly determined with 87% by the supply of raw materials: cement accounts for 72 % and steel for 13 %. The thermal energy requirement and use of electricity contribute with 7 % to the GWP factor and the transport of preliminary products with approx. 6 %.

Depletion potential of the stratospheric ozone layer (ODP)
The Ozone depletion potential is dominated almost exclusively by the preliminary products (approx. 100 %) and within them almost exclusively by the use of cement. The use of electricity causes 100% of the ODP factor within manufacturing (A3).

Acidification potential of land and water (AP)
The Acidification potential is determined by 54 % by cement and 23 % by steel in the production stage. The use of energy sources in A3 contributes for 7 % to the AP. With approx. 11 %, the transports have a minor influence on the acidification potential.

Eutrophication potential (EP)
The Eutrophication potential is determined by 69 % by cement and with 12 % by steel in the production stage. The use of energy sources in A3 contributes for 4 % to the EP. With approx. 11 %, the transports have a minor influence on the acidification potential.

Potential of tropospheric ozone photochemical oxidants (POCP)
About 82 % of the Photochemical oxidant potential is triggered by the use of cement and by the use of steel (43 %). Due to different reinforcement components in the product, the POCP factor can fluctuate by -10 % to + 4 %.

The negative POCP value for the transports is explained by the methodical approach in calculating the impact indicator: The negative POCP in the transports is caused by the division of the NOX emissions into the two individual emissions NO2 and NO. The NO has a negative influence on the POCP, as it reduces the formation of ozone near the ground.

Abiotic depletion potential for non-fossil resources (ADP elem.)
The ADP elem.-value is determined almost exclusively by the provision of cement (92 %) and steel (5 %) at the production stage. Electricity contributes for 1 % to the ADP elem.-factor.

Abiotic depletion potential for fossil resources (ADP foss.)
Within the production stage (A1–A3), the ADP foss.-value results mainly from high energy consumption required for the provision of cement and steel (approx. 64 % in total). The use of electricity contributes for 4 %, fuel for 9 %.

Within the production (A1–3), the **total primary energy demand** is divided between approx. 82 % nonrenewable energy sources and approx. 18 % renewable energies.

Total use of non-renewable primary energy resources (PENRT)
The demand for non-renewable primary energy resources result mainly for 71% from raw materials (A1). The transport of the preliminary products (A2) contribute for 12 % and the production of the declared product (A3) for 16 % to the PENRT value.
For the disposal of the construction waste additional use of non-renewable energy is due at the end of life. In practice, different proportions of reinforcement are used in the product (0.022 - 0.033 M%) and can cause fluctuations in the non-renewable primary energy demand (PENRT) in the range of -6 % to + 2 % within the production (A1–3).

Total use of renewable primary energy resources (PERT)
In comparison to the PENRT value the share of renewable resources is low. The majority of the PERT value is made up of raw material supply (A1) with 89 %, transportation 3% and the energy required for production with approx. 7 %.
For the disposal of the construction waste additional use of renewable energy is due at the end of life.

In practice, different proportions of reinforcement are used in the product (0.022 - 0.033 M%) and can cause fluctuations in the renewable primary energy demand (PERT) within the production (A1–3) in the range from -12 % to + 5 %.

7. Requisite evidence

Not relevant.

8. References

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EN 15804
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ISO 14025
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