

ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	British Precast Concrete Federation
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-BPC-20190090-CBG1-EN
Issue date	05/08/2019
Valid to	04/08/2024

UK Manufactured Precast Concrete T-Beam
Produced by members of the British Precast
Flooring Federation (PFF) a product group of
the British Precast Concrete Federation

www.ibu-epd.com / <https://epd-online.com>



General Information

British Precast Flooring Federation

Programme holder

IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number

EPD-BPC-20190090-CBG1-EN

This Declaration is based on the Product Category Rules:

Pre-cast concrete components, 07.2014
(PCR tested and approved by the SVR)

Issue date

05/08/2019

Valid to

04/08/2024



Dipl. Ing. Hans Peters
(President of Institut Bauen und Umwelt e.V.)



Dr. Alexander Röder
(Managing Director IBU)

Precast Concrete T-Beam

Owner of the Declaration

British Precast Flooring Federation
The Old Rectory
Main Street, Glenfield, LE3 8DG
Leicester, United Kingdom

Declared product / Declared unit

1 linear metre of Generic Precast Concrete T-Beam

Scope:

This is an association declaration which uses manufacturing data from member companies of the British Precast Flooring Federation (PFF) and a defined mix design to form an average linear metre of precast concrete T-Beam. This EPD is based on production data which represents 100% of PFF's total recorded precast concrete production volume. It is based on data covering a period of 12 months (From January to December 2016). All data was collected from UK factories.

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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR

Independent verification of the declaration
according to /ISO 14025/

☐ internally ☒ externally



Mr Carl-Otto Neven
(Independent verifier appointed by SVR)

Product

Product description / Product definition

The product declared in this EPD is 1m length of generic precast concrete T-Beam. The beam is made from precast concrete with prestressed steel reinforcement and when installed is combined with infill blocks to produce a beam and block flooring system. Concrete T-Beams are made of cement, aggregates, steel, water and (if needed) admixtures.

Beams are self-bearing and blocks are non-resisting or semi-resisting. Infill blocks may be standard walling blocks to /BS EN 771/ or purpose made flooring infill blocks. Blocks should be transverse load tested and capable of sustaining a central point load of 3.5kN.

The values given in this EPD do not include the infill blocks

Spans of up to 8m can be achieved depending on loading conditions. Manufacturers should be consulted for full information and design services.

The T-Beam used in this EPD has been given a specific set of dimensions and associated mass for the purpose of determining potential carbonation of the

concrete through exposed surface area. Typically, beam depths may be 150mm, 175mm or 225mm. Beam weights are typically 35kg/m for 150mm deep beams.

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 15037-1, Precast concrete products - Beam-and-block floor systems — Part 1: Beams/ and the CEmarking. For the application and use the respective national provisions apply.

Application

Beam and Block Floor Systems combine precast prestressed concrete beams and infill blocks to produce high quality economic ground and upper floors in residential and other building types.

Beam and block floors may be used for garages where specified in conjunction with a reinforced concrete topping. The structural topping should be designed by

a competent person in accordance with current design codes.

Technical Data

European Standard /EN 15037/ for beam-and-block floor systems is made of 5 parts:

Precast concrete T-Beams are manufactured to /EN 15037-1/

For common aspects reference is made to /EN 13369/, from which also the relevant requirements of the /EN 206-1/ are taken. Concrete in the UK is specified in accordance with /BS8500/ and /BS EN 206/.

For geometrical data, detailing, mechanical strength, fire resistance, acoustic insulation parameters and durability see the design specifications.

Constructional data

Name	Value	Unit
Thermal conductivity	2	W/(mK)
Calculation value for thermal conductivity	2	W/(mK)
Water vapour diffusion resistance factor	15	-
Sound absorption coefficient (up to 500Hz)	0.01	%
Gross density	2400	kg/m ³
Compressive strength (cylinder)	50	N/mm ²
Tensile strength	4.07	N/mm ²
Flexural strength	4.07	N/mm ²
Modulus of elasticity (concrete)	33550	N/mm ²
Equilibrium moisture content (at 60% RH)	3.9	%
Prestressing steel stress	1770	N/mm ²

Performance data of the product in accordance with

LCA: Calculation rules

Declared Unit

The product declared in this EPD is 1m length of generic precast concrete T-Beam. The beam is made from precast concrete with prestressed steel reinforcement.

Typically, beam depths may be 150mm, 175mm or 225mm. Beam weights are typically around 35kg/m for 150mm deep beams. The mix defined for this EPD has a weight of 33.4 kg/m.

Declared unit

Name	Value	Unit
Density (Concrete Only)	2430	kg/m ³
Conversion factor to 1 kg	0.0299	-
Declared unit	0.0334	t

This EPD is based on production data which represents 100% of PFF's total recorded precast concrete production volume. It is based on data covering a period of 12 months (From January to December 2016). All data was collected from UK factories.

System boundary

Type of EPD: Cradle to Gate with all options declared. The modules considered in the Life Cycle Assessment are modules A1-C4.

the Declaration of Performance with respect to its Essential Characteristics according to /EN 15037-1, Precast concrete products - Beam-and-block floor systems — Part 1: Beams/

The information contained within the Constructional Data table is based on Precast Flooring Federation (PFF) Technical Committee agreed performance data.

Base materials / Ancillary materials

The generic concrete T-Beam represented in this EPD is constituted as follows:

CEM I - 19.6%
Primary Aggregate (generic) - 78.2%
Steel Reinforcement - 2%
Admixture - 0.1%

The generic T-Beam constituent materials are representative of average UK products based on an agreed mix defined by the PFF.

The mix will vary between manufacturers. For details of a product mix or specification contact the PFF member.

No /REACH Regulation 2018/ substances of very high concern are included.

Reference service life

/BS 8500/, the UK's concrete specification standard complementary to /EN206/, sets durability requirements for reinforced concrete elements. The reference service life (RSL) for the declared unit is 100 years.

Cut-off criteria

/EN 15804/ requires that where there are data gaps or insufficient input data for a unit process the cut-off criteria shall be 1% of renewable and non-renewable primary energy usage and 1% of the total mass of this unit process. The total neglected flows from a product stage must be no more than 5% of product inputs by mass or 5% of primary energy contribution. In this assessment, all information gathered from data collection for the production of precast concrete has been modelled, i.e. all raw materials used, the electrical energy and other fuels used, use of ancillary materials and all direct production waste. Transport data on input and output flows are also considered. Scenarios have been developed to account for downstream processes such as fabrication, installation, demolition and waste treatment. No cutoffs have been made. Hence this study complies with the cut-off criteria defined in the PCR.

Background data

Background data is based primarily on a generic dataset /GaBi ts 2014/ integrated into the IBU verified bespoke British Precast Envision EPD tool. The background data also includes UK specific cement data supplied by members of the

Mineral Products Association (MPA). (Tool Verified 07/03/17).

Allocation

All allocation is performed according to the /PCR part B/. As no co-products are produced, the flow of materials and energy and also the associated release of substances and energy into the environment are related exclusively to the concrete produced.

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.

LCA: Scenarios and additional technical information

The following information supports the declaration of modules A1-C4 inclusive.

Transport to the building site (A4)

Name	Value	Unit
Transport distance	137.4	km
Capacity utilisation (including empty runs)	50	%

Installation into the building (A5)

Name	Value	Unit
Material loss	0.009	%

Use or application of the installed product (B1)

In practice, given the nature of the product and its application in the structure of the building, no impacts are associated with the use stage of concrete over the lifetime of the building. However, carbonation of concrete will occur during the lifetime of the building and is included in module B1. Carbonation is calculated using the approach recommended by the Mineral Products Association and British Precast Concrete Federation (BPCF) and follows the methodology developed by Pommer et al. /Pommer 2005/, with reference to the work of Engelsen and Justnes /Engelsen 2014/, who have made further refinements related to the amount of Calcium Oxide (CaO) that can carbonate and the carbonation of slag.

For precast concrete carbonation factors based on BPCF research and expert judgement have been used. In this case use phase carbonation has not been modelled due to the assumption that a ground beam will not be exposed to the air on any surface. The study period is assumed to be 100 years (the RSL).

Modules B2 - B7 (Maintenance, Repair, Replacement, Refurbishment, Operational Energy Use, Operational Water Use)

It is assumed that the precast concrete beams covered by this EPD do not require maintenance, repair, replacement or refurbishment during their lifetime. Consequently, the impacts associated with these lifecycle stages are zero. There is no operational energy or operational water requirement associated with the product, however, it is acknowledged that any building material choice will have an impact on the operational energy and, in some cases, the operational water demand of the final building.

Reference service life

/BS 8500/, the UK's concrete specification standard complementary to EN206, sets durability requirements

for reinforced concrete elements. The reference service life (RSL) for the declared unit is 100 years.

Reference service life

Name	Value	Unit
Reference service life	100	a

End of life (C1-C4)

Name	Value	Unit
Recycling	90	%
Landfilling	10	%

LCA: Results

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

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	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m Generic Precast Concrete T-Beam

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP	[kg CO ₂ -Eq.]	6.68E+0	3.13E-1	7.84E-6	-3.67E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-2.10E-2	1.16E-1	-6.36E-1	-2.31E-4
ODP	[kg CFC11-Eq.]	5.05E-8	3.69E-14	8.26E-18	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.36E-14	8.43E-14	5.47E-14
AP	[kg SO ₂ -Eq.]	1.08E-2	1.31E-3	5.30E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.83E-4	5.40E-4	3.18E-4
EP	[kg (PO ₄) ³⁻ -Eq.]	8.87E-4	3.14E-4	1.27E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.16E-4	1.29E-4	4.34E-5
POCP	[kg ethene-Eq.]	3.90E-3	-4.99E-4	5.72E-9	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.85E-4	5.83E-5	2.51E-5
ADPE	[kg Sb-Eq.]	1.32E-5	5.08E-9	1.38E-11	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.88E-9	1.41E-7	1.93E-8
ADPF	[MJ]	3.46E+1	4.31E+0	1.47E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.59E+0	1.50E+0	6.96E-1

Caption GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources

RESULTS OF THE LCA - RESOURCE USE: 1 m Generic Precast Concrete T-Beam

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	[MJ]	3.60E+0	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
PERM	[MJ]	0.00E+0	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
PERT	[MJ]	3.60E+0	1.06E-1	1.17E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.90E-2	1.19E-1	8.40E-2
PENRE	[MJ]	3.86E+1	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
PENRM	[MJ]	0.00E+0	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND	IND
PENRT	[MJ]	3.86E+1	4.32E+0	1.51E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.60E+0	1.54E+0	7.21E-1
SM	[kg]	1.14E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	1.23E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	7.74E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m ³]	1.03E-2	3.69E-5	4.04E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.36E-5	4.12E-4	1.37E-4

Caption 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 resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 m Generic Precast Concrete T-Beam

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	[kg]	7.95E-4	1.77E-8	5.30E-12	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.54E-9	5.40E-8	1.14E-8
NHWD	[kg]	1.13E+0	4.72E-5	6.94E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.74E-5	7.08E-4	3.34E+0
RWD	[kg]	1.60E-3	4.72E-5	6.94E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.75E-6	1.44E-5	9.85E-6
CRU	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	[kg]	0.00E+0	0.00E+0	3.00E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.91E+1	0.00E+0
MER	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EET	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Caption HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

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/ISO 14025/

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