

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-20170092-CCD1-EN
Issue date	26/07/2017
Valid to	25/07/2022

UK Manufactured Precast Concrete Blocks
Produced by members of the Concrete Block
Association (CBA)
a product group of British Precast

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CONCRETE BLOCK
ASSOCIATION

General Information

British Precast Concrete Federation

Programme holder

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

Declaration number

EPD-BPC-20170092-CCD1-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

26/07/2017

Valid to

25/07/2022



Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)



Dr. Burkhard Lehmann
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1m² Generic Precast Concrete Blocks

Owner of the Declaration

British Precast
The Old Rectory
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Leicester, United Kingdom

Declared product / Declared unit

1m² generic precast concrete blocks with an average gross density of 1425 kg m³.

Scope:

This is an association declaration which uses average data from member companies of the Concrete Block Association (CBA) to form an average 1m² precast concrete blocks. It is based on data covering a period of 12 months (From January to December 2014). All data were 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 declared product is a generic 1m² of precast concrete blocks. Concrete blocks are made of cement, aggregates, water and (if needed) admixtures. The blocks covered by this EPD have been manufactured by batch moulding, where the dry components are thoroughly mixed before a measured amount of water is added and mixing continues. This semi-dry mix is fed into a mould and mechanically pressed to form the block shape. Once demoulded, the blocks are cured, in a warm and humid chamber, covered storage area or out in the open. Mortar is not included in this EPD. Primary data for the production of precast concrete blocks were collected from members of the Concrete Block Association (CBA). This data were used to generate a mass weighted average of production for the EPD.

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 /CPR/ applies. The product needs a Declaration of Performance taking into consideration /BS EN 771-3,2011, Specification for masonry units. Aggregate concrete masonry units (Dense and lightweight aggregates)/ and the CE-marking. For the application and use the respective national provisions apply.

Application

Precast concrete blocks are used in a variety of applications including both interior and exterior load bearing and non-load bearing walls.

Technical Data

Dense and Light weight concrete blocks are manufactured to /BS EN 771-3/

Constructional data

Data in accordance with the Declaration of Performance and the following data:

Name	Value	Unit
Thermal conductivity	0.25 - 1.33	W/(mK)
Gross density	700 - 2100	kg/m ³
Compressive strength	3.6 - 30	N/mm ²
Dimensional tolerance	D1	-
Configuration	Group 1	-
Dimensional stability	<1	mm/m
Shear bond strength	0,15	N/mm2
Reaction to fire	A1	-
Water absorption	N/A	-
Water vapour permeability	5/15	-
Durability against freeze / thaw	For use above and below ground	-

Performance data of the product in accordance with the Declaration of Performance with respect to its Essential Characteristics according to /EN 771-3 2011, Specification for masonry units. Aggregate concrete masonry units/

The information contained within the Constructional Data table is based on CBA Technical Committee agreed performance data.

Base materials / Ancillary materials

The concrete mix proportions are as follows: aggregates 84.7%; cement 8%; PFA; 5% water 2.3%;

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

Reference service life

Precast concrete blocks are a durable product. Walls constructed from the products will have durability equivalent to walls of other traditional masonry and will fulfil their intended function for the life of the building in which they have been installed. With reference to masonry products declared under the same IBU scheme the reference service life (RSL) is 150 years.

LCA: Calculation rules

Declared Unit

The declared unit is 1m² of generic precast concrete blocks (750 - 2100 kg/m³). The EPD covers blocks in the density described, for calculation purposes the average of the upper and lower limit is taken as the density. The data used in the LCA calculations is an average based on total annual production figures from members of the CBA. Concrete blocks are manufactured to a range of dimensions, 440 x 215 x 100 mm taken as the dimensions for this EPD. Information on density and other physical characteristics are shown in the table below.

Declared unit

Name	Value	Unit
Density (mean value)	1425	kg/m ³
Declared unit	0.1425	t
Declared unit	1	m ²
Grammage	142.5	kg/m ²

System boundary

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

Packaging

The amount and type of packaging used on precast concrete blocks will vary dependent on specific requirements. In a proportion of cases product will need no packaging other than banding and pallets for transportation. In other circumstances, the product will be stacked, banded, shrink-wrapped and placed on pallets for transportation.

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 cut-offs have been made. Hence this study complies with the cut-off criteria defined in the /PCR/.

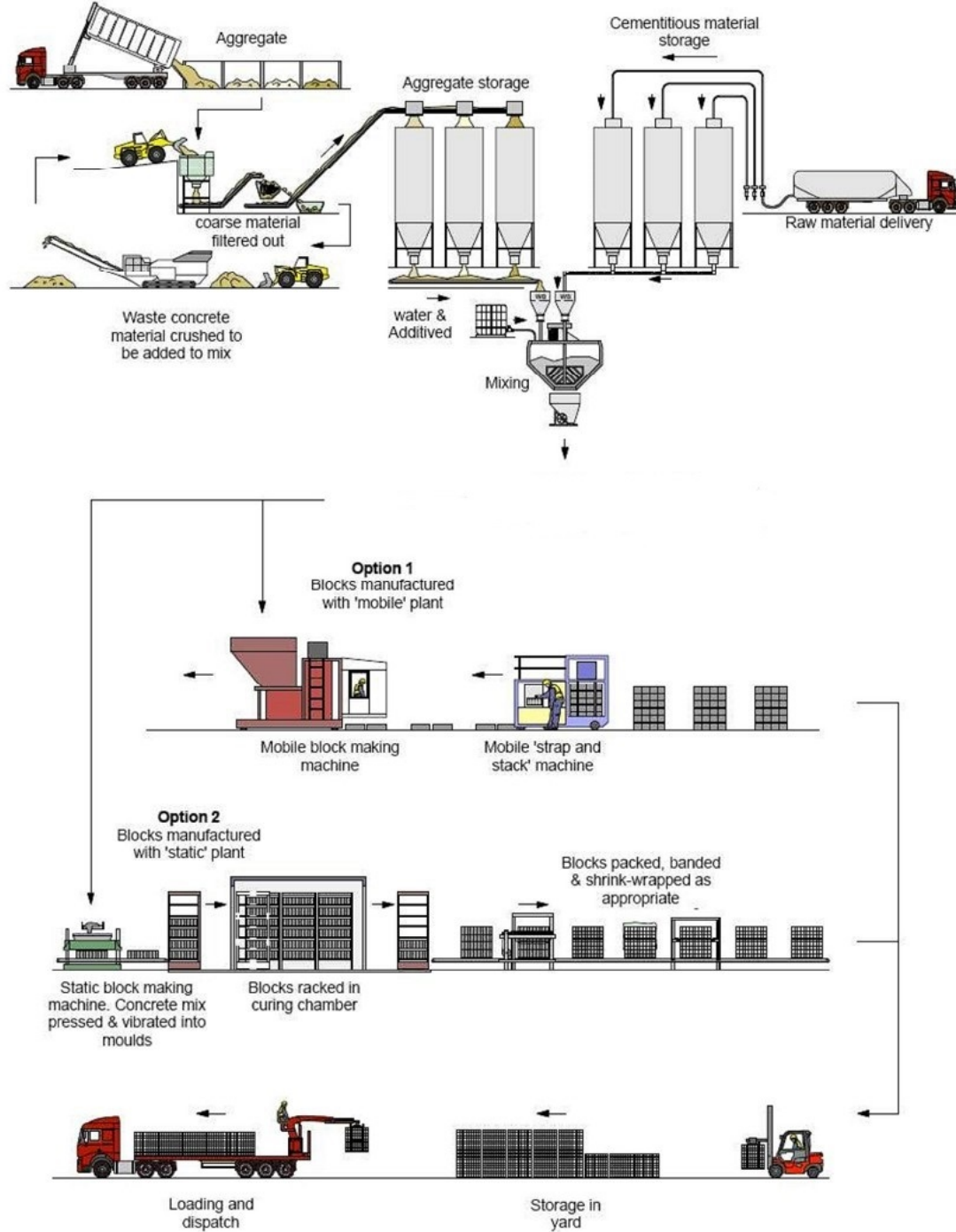
Background data

Background data is based primarily on a generic dataset /GaBi ts 2014 software database/ 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/. 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.

Typical Process Flow Diagram
For Light Weight & Dense Concrete Blocks



NR Richards Associates Ltd

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-C3 inclusive.

Transport to the building site (A4)

Name	Value	Unit
Transport distance	49.7	km
Capacity utilisation (including empty runs)	50	%

Installation into the building (A5)

Name	Value	Unit
Material loss	3	%

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 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 CaO that can carbonate and the carbonation of slag.

For precast concrete carbonation factors based on BPCF research and expert judgement have been used. The surface area is assumed to be 2m² based on two exposed faces of each concrete block in a 1m² structure.

The study period is assumed to be 150 years (the RSL).

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

The precast concrete blocks 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

Walls constructed from the products will have durability equivalent to walls of other traditional masonry and will fulfil their intended function for the life of the building in which they have been installed. With reference to clay masonry products declared under the same IBU scheme the reference service life (RSL) is 150 years.

Name	Value	Unit
Reference service life	150	a

End of life (C1-C4)

Name	Value	Unit
Recycling	90	%
Landfilling	10	%

LCA: Results

In Table 1 "Description of the system boundary", all declared modules are indicated with an "X"; Module D which is not declared is indicated with "MND". Indicator values are declared to three significant digits.

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	X	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1m² Generic Precast Concrete Block

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP	[kg CO ₂ -Eq.]	13.00	0.50	0.03	-3.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.34	0.23
ODP	[kg CFC11-Eq.]	9.01E-8	3.37E-13	2.21E-13	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.34E-13	3.51E-12	2.54E-12
AP	[kg SO ₂ -Eq.]	2.53E-2	2.07E-3	8.43E-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	2.06E-3	2.33E-3	1.37E-3
EP	[kg (PO ₄) ³ -Eq.]	2.35E-3	5.08E-4	1.93E-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	5.04E-4	5.63E-4	1.87E-4
POCP	[kg ethene-Eq.]	6.59E-3	-7.77E-4	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	-7.71E-4	3.40E-4	1.32E-4
ADPE	[kg Sb-Eq.]	5.32E-4	9.33E-9	2.11E-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	9.26E-9	6.00E-7	7.90E-8
ADPF	[MJ]	78.90	6.84	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.78	6.39	2.97
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: 1m² Generic Precast Concrete Block

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
PERE	[MJ]	7.95	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
PERM	[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
PERT	[MJ]	7.95	0.14	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.49	0.35
PENRE	[MJ]	85.00	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
PENRM	[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
PENRT	[MJ]	85.00	6.85	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.80	6.55	3.08
SM	[kg]	39.10	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
RSF	[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
NRSF	[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
FW	[m ³]	2.89E-2	4.45E-4	1.05E-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	4.42E-4	1.84E-3	6.29E-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:

1m² Generic Precast Concrete Block

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	[kg]	1.40E-3	3.19E-8	1.60E-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	3.17E-8	4.68E-7	7.04E-8
NHWD	[kg]	3.60E+0	1.20E-4	1.53E-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	1.19E-4	3.11E-3	1.43E+1
RWD	[kg]	2.48E-3	7.35E-6	3.85E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.29E-6	6.36E-5	4.31E-5
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]	0.00	0.00	4.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124.00	0.00
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														

Interpretation

Interpretation of the results has been carried out considering the methodology, data-related assumptions and any limitations declared in the EPD.

Interrogation of the LCA results show that the cradle-to-grave **GWP** (Global Warming Potential) impact of 1m² of aggregate concrete blocks is 10.6 kgCO₂e (Modules A1-C4).

For **GWP**, A1-A3 accounts for 123% of the lifecycle impact with carbonation in the use phase and post-demolition, reducing the overall impact of the blocks. Carbonation in the use phase alone reduces the **GWP** impact by 38%.

The LCA results show that the cradle-to-grave primary energy demand of the declared unit is 117.6 MJ (Modules A1-C4).

Analysis of the **PERT/ PENRT** (Total use of renewable primary energy resources/ Total use of non-renewable primary energy resources) figures shows the largest contributors are cement 40(%), aggregates and powders 19(%) and utilities used in production 12(%).

For primary energy demand, A1-A3 accounts for 79% of the lifecycle impact.

The cradle-to-grave Net use of fresh water (**FW**) is 0.032m³ (Modules A1-C4) with the product stage (A1-A3) accounting for 89% of this.

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PCR Part A

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PCR Part B

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thinkstep

GaBi ts 2014 software database

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