# ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

<table>
<thead>
<tr>
<th>Owner of the Declaration</th>
<th>British Precast Concrete Federation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme holder</td>
<td>Institut Bauen und Umwelt e.V. (IBU)</td>
</tr>
<tr>
<td>Publisher</td>
<td>Institut Bauen und Umwelt e.V. (IBU)</td>
</tr>
<tr>
<td>Declaration number</td>
<td>EPD-BPC-20190044-CBG1-EN</td>
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<tr>
<td>Issue date</td>
<td>07/06/2019</td>
</tr>
<tr>
<td>Valid to</td>
<td>06/06/2024</td>
</tr>
</tbody>
</table>

UK manufactured single leaf brick-faced concrete cladding
Produced by members of British Precast
Architectural and Structural a product group of
the British Precast Concrete Federation

www.ibu-epd.com / https://epd-online.com
General Information

British Precast Architectural and Structural

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

Declaration number
EPD-BPC-20190044-CBG1-EN

This declaration is based on the product category rules:
Pre-cast concrete components, 07.2014
(PCR checked and approved by the SVR)

Issue date
07/06/2019

Valid to
06/06/2024

Owner of the declaration
British Precast Ltd
The Old Rectory
8 Main Street, Glenfield
Leicester, LE3 8DG

Declared product / declared unit
1m² of concrete cladding panel, single leaf 150mm with 50mm brick-face. Includes insulation and plasterboard.

Scope:
This is an association declaration which uses manufacturing data from member companies of British Precast Architectural & Structural (BPAS) and a defined mix design to form an average 1m² of precast concrete cladding panel wall unit with a brick face. It is based on data covering 55,884 tonnes of precast concrete production over a period of 12 months (From January to December 2015). This covers the majority of cladding of the type described in the functional unit manufactured by the membership of British Precast Architectural and Structural.

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 standard /EN 15804/ serves as the core PCR
Independent verification of the declaration and data according to /ISO 14025:2010/

Product

Product description / Product definition
The declared product is a 1m² of concrete cladding panel single leaf 150mm with 50mm brick face. Including rebar consisting of 2 layers of B503 mesh. Mortar for pointing of brick face. Stainless steel fixings consisting of 2 restraints and 2 dowels per panel. The declared unit includes insulation and plasterboard. Precast concrete is made of cement, aggregates, water, and (if needed) admixtures. Primary data for the production of the precast panels was collected from members of British Precast Architectural and Structural (BPAS).

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 Construction Product Regulation/CP/ applies. The product needs a Declaration of Performance taking into consideration /EN14992:2007+A1:2012/ Precast concrete products - Wall elements and the CE marking. For the application and use the respective national provisions apply.

Application
Precast concrete cladding can be used as a structural element but is more usually used as a non-structural decorative façade to a building. Precast concrete cladding can be used in precast frame constructions. The majority is used with in-situ concrete or steel frames, and for refurbishments.

Technical Data
Concrete is specified in accordance with British Standard /BS 8500/ and /BS EN 206/.
Precast concrete cladding panels are manufactured to
Environmental Product Declaration British Precast (BPAS) – Brick-faced Concrete Cladding


Constructional data

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross density (Concrete only)</td>
<td>2380</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Compressive strength (Concrete only)</td>
<td>40</td>
<td>N/mm²</td>
</tr>
<tr>
<td>Ultimate tensile strength (Steel)</td>
<td>650</td>
<td>N/mm²</td>
</tr>
<tr>
<td>Tensile yield strength (Steel)</td>
<td>500</td>
<td>N/mm²</td>
</tr>
</tbody>
</table>

Performance data of the product in accordance with the Declaration of Performance (DoP) with respect to its Essential Characteristics according to /EN 14992:2007 +A1:2012/ Precast Concrete Products: Wall Elements

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

Base materials / Ancillary materials

The element design used to generate this EPD is as follows:
- CEM I - 63kg
- Primary Aggregate - 270kg
- Brick - 95kg
- Insulation - 12kg
- Plasterboard - 8.35kg
- Steel Reinforcement - 12kg
- Steel fixings - 1.7kg
- Mortar - 9kg

The concrete mix agreed by the BPAS technical committee is designed to be representative of average UK products. For further information on the mix design and coverage of this EPD contact the British Precast technical team +44 (0)116 232 5170. The concrete mix and product build will vary between manufacturers. For details of a products mix contact the individual BPAS member.

No /REACH/ 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 precast concrete elements. The reference service life (RSL) for the declared unit is 100 years.

LCA: Calculation rules

Declared Unit

The declared product is a 1m² of concrete cladding panel single leaf 150mm with 50mm brick face. Including rebar consisting of 2 layers of B503 mesh. Mortar for pointing of brick face. Stainless steel fixings consisting of 2 restraints and 2 dowels per panel. The declared unit includes insulation and plasterboard. Information on density and other physical characteristics are shown in the table below.

Declared unit

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (Concrete Only)</td>
<td>2380</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Declared unit</td>
<td>1</td>
<td>m²</td>
</tr>
<tr>
<td>Grammage</td>
<td>487</td>
<td>kg/m²</td>
</tr>
</tbody>
</table>

The EPD is based on data covering 55,884 tonnes of precast concrete production over a period of 12 months (From January to December 2015). This covers the majority of cladding of the type described in the functional unit manufactured by the membership of British Precast Architectural and Structural. This is representative of UK produced cladding panels.

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.

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 Product Category Rule /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.

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.

<table>
<thead>
<tr>
<th>Transport to the building site (A4)</th>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport distance</td>
<td>279</td>
<td>km</td>
<td></td>
</tr>
<tr>
<td>Capacity utilisation (including empty runs)</td>
<td>50</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installation into the building (A5)</th>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material loss</td>
<td>0.009</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

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 on exposed surfaces 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 Calcium oxide CaO that can carbonate and the carbonation of slag.

For precast concrete brick-faced cladding panels carbonation factors based on British Precast Concrete Federation (BPCF) research and expert judgement have been used. The exposed surface area is assumed to be 0m² based on the brick facing covering the external surface. Carbonation of the panels other surface will depend on cavity conditions and so was not modelled in this EPD.

The study period is assumed to be 100 years (the RSL).

<table>
<thead>
<tr>
<th>End of life (C1-C4)</th>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycling</td>
<td>90</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Landfilling</td>
<td>10</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

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

It is assumed that the precast concrete cladding covered by this EPD does not require maintenance, repair, replacement or refurbishment during its 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 precast concrete elements. The reference service life (RSL) for the declared unit is 100 years.
## RESULTS OF THE LCA - RESOURCE USE: 1m² of concrete cladding panel single leaf 150mm with 50mm brick face

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>B5</th>
<th>B6</th>
<th>B7</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERE</td>
<td>MJ</td>
<td>1.45E+2</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>PERM</td>
<td>MJ</td>
<td>9.55E+1</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<td>IND</td>
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<td>IND</td>
<td>IND</td>
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<tr>
<td>PERT</td>
<td>MJ</td>
<td>1.20E+1</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<td>IND</td>
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<tr>
<td>PENRE</td>
<td>MJ</td>
<td>9.23E-8</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<td>IND</td>
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<tr>
<td>PENRT</td>
<td>MJ</td>
<td>2.17E+1</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>SM</td>
<td>kg</td>
<td>2.29E+2</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<tr>
<td>RSF</td>
<td>MJ</td>
<td>9.23E-8</td>
<td>IND</td>
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<tr>
<td>FW</td>
<td>m³</td>
<td>2.70E+0</td>
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</table>

**Caption:** PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy 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; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; FW = Use of net fresh water.

## RESULTS OF THE LCA - OUTPUT FLOWS AND WASTE CATEGORIES: 1m² of concrete cladding panel single leaf 150mm with 50mm brick face

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>B5</th>
<th>B6</th>
<th>B7</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWD</td>
<td>kg</td>
<td>7.64E-3</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>NHWD</td>
<td>kg</td>
<td>1.32E+1</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<tr>
<td>RVW</td>
<td>kg</td>
<td>3.71E-3</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<tr>
<td>CRU</td>
<td>kg</td>
<td>1.14E+1</td>
<td>IND</td>
<td>IND</td>
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<tr>
<td>MFR</td>
<td>kg</td>
<td>1.00E+0</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<tr>
<td>MER</td>
<td>kg</td>
<td>1.00E+0</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<tr>
<td>EEE</td>
<td>kg</td>
<td>1.00E+0</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
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<tr>
<td>EET</td>
<td>kg</td>
<td>1.00E+0</td>
<td>IND</td>
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</table>

**Caption:** HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RVW = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy.
References

/IBU 2016/
IBU (2016): General Programme Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt e.V., Version 1.1 Institut Bauen und Umwelt e.V., Berlin.
www.ibu-epd.de

/ISO 14025/
DIN EN ISO 14025:2011-10, Environmental labels and declarations — Type III environmental declarations — Principles and procedures

/EN 15804/
/EN 15804:2012-04+A1 2013/, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

/PCR Part A/
Institut Bauen und Umwelt e.V., Berlin (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. April 2013

/PCR Part B/

/EN ISO 14044/

/EN 206/
BS EN 206:2013: Concrete. Specification, performance, production and conformity

Precast Concrete Products – Wall Elements.

/EU No 305/2011/
Regulation (EU) No 305/2011 - construction products regulation

/BS 8500/

/Engelsen 2014/
Engelsen, C. and Justnes, H. (2014) CO2 binding by concrete - Summary of the state of the art and an assessment of the total binding of CO2 by carbonation in the Norwegian concrete stock. SINTEF Building and Infrastructure, Oslo, Norway.

/Pommer 2005/
Pommer, K. and Pade, C (2005) Guidelines - Uptake of carbon dioxide in the life cycle inventory of concrete. Danish Technological Institute, Copenhagen, Denmark

/thinkstep/
GaBi ts 2014 software database

/REACH 2006/