ENVIRONMENTAL PRODUCT DECLARATION
as per ISO 14025 and EN 15804

Owner of the Declaration | BASF plc, Construction Chemicals
Aggregate Industries UK Limited
Programme holder | Institut Bauen und Umwelt e.V. (IBU)
Publisher | Institut Bauen und Umwelt e.V. (IBU)
Declaration number | EPD-BAS-20160227-CAA1-EN
Issue date | 25.11.2016
Valid to | 24.11.2021

Watertight™ Ready-mixed Concrete
Aggregate Industries UK Limited

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

Aggregate Industries UK Limited
Programme holder
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Germany

Watertight™ Ready-mixed Concrete
Owner of the Declaration
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Declaration number
EPD-BAS-20160227-CAA1-EN

This Declaration is based on the Product Category Rules:
Concrete components made of in-situ or ready-mixed concrete, 07.2014
(PCR tested and approved by the SVR)

Issue date
25.11.2016

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24.11.2021

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

Dr. Burkhard Lehmann
(Managing Director IBU)

Dr. Mathias Schulz
(Independent verifier appointed by SVR)

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Verification
The CEN Norm /EN 15804/ serves as the core PCR
Independent verification of the declaration according to ISO 14025:

- [x] externally

Product

Product description
Ready-mix concrete is manufactured in stationary or mobile concrete batching plants. The concrete is a composite material basically manufactured to a set recipe/mix design by mixing cement, water and aggregates. Additionally concrete additives and admixtures can be used to change and improve the concrete properties in fresh and/or hardened state. Ready-mix concrete is normally transported in a fresh state to the construction site by truck mounted transit mixers and is poured into formwork, compacted when necessary, cured and demoulded after hydration in the hardened state and shape.

Application
Ready-mix concrete is used as a construction material for building works, to be placed on-site. The selected ready-mix concrete is used as finished element for construction (residential, non-residential, infrastructure).
Technical Data
Table below provides technical construction data with reference to the test standard /PCR Part B/:

<table>
<thead>
<tr>
<th>Constructional data</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal conductivity</td>
<td>n/a*</td>
<td>W/(mK)</td>
</tr>
<tr>
<td>Calculation value for thermal conductivity</td>
<td>n/a*</td>
<td>W/(mK)</td>
</tr>
<tr>
<td>Water vapour diffusion resistance factor</td>
<td>n/a*</td>
<td>-</td>
</tr>
<tr>
<td>Sound absorption coefficient</td>
<td>n/a*</td>
<td>%</td>
</tr>
<tr>
<td>Gross density /BS EN 12390/</td>
<td>2386</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Compressive strength /BS EN 12390/</td>
<td>50</td>
<td>N/mm²</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>n/a*</td>
<td>N/mm²</td>
</tr>
<tr>
<td>Flexural strength /BS EN 12390/</td>
<td>5</td>
<td>N/mm²</td>
</tr>
<tr>
<td>Modulus of elasticity</td>
<td>n/a*</td>
<td>N/mm²</td>
</tr>
<tr>
<td>Equilibrium moisture content</td>
<td>n/a*</td>
<td>%</td>
</tr>
</tbody>
</table>

n/a*: not applicable

Base materials / Ancillary materials

List of main basic materials and ancillary materials:

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>5 - 15</td>
<td>%</td>
</tr>
<tr>
<td>Admixtures</td>
<td>&lt;1</td>
<td>%</td>
</tr>
<tr>
<td>SCM (Supplementary Cementitious Materials)</td>
<td>5 - 15</td>
<td>%</td>
</tr>
<tr>
<td>Sand</td>
<td>30 - 45</td>
<td>%</td>
</tr>
<tr>
<td>Aggregate</td>
<td>35 - 50</td>
<td>%</td>
</tr>
<tr>
<td>Water</td>
<td>1 - 15</td>
<td>%</td>
</tr>
</tbody>
</table>

The product does not contain materials that are listed in "Candidate List of Substances of Very High Concern for Authorisation" /REACH/.

Reference service life
The construction's life time is defined to be 60 years, while the service life of the concrete product is 60 years. This results in 0 complete replacements.

LCA: Calculation rules

Declared Unit
The declared unit is:

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declared unit</td>
<td>1</td>
<td>m³</td>
</tr>
<tr>
<td>Density</td>
<td>2386</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Conversion factor to 1 kg</td>
<td>0.000419</td>
<td>-</td>
</tr>
</tbody>
</table>

System boundary
The type of EPD is cradle-to-gate. The system boundaries include the life cycle stages as follows, which are accordant to EN 15804:

- Raw material extraction and processing (module A1)
- Transport to manufacturer (module A2)
- Manufacturing (A3)

The background data applied for the calculation of the LCA is representative for Europe and is derived from the /GaBi database/. The energy demand for manufacturing of concrete is not a main contributor to the LCA results and therefore can be estimated with European background data.

The life cycle assessment was calculated with the Life Cycle Analyzer, a tool from BASF developed with support of thinkstep AG.

For the admixtures data from BASF /BASF 2011/ and existing Model EPDs /Bauchemie 2014/ are used.

The underlying primary data was collected by Aggregate Industries UK Limited for their Newbold plant in the United Kingdom and is representative for the production year of 2015.

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 used background database has to be mentioned.

LCA: Scenarios and additional technical information

This EPD focuses on the manufacturing stage of Watertight™ Ready-mixed Concrete (modules A1- A3). Therefore, no information on modules A4, B1-B7, C1-C4 and D is provided in this section of the EPD.
The tables below give the LCA results for the environmental impacts, resource use as well as output flows and waste categories for the modules that are declared.

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

<table>
<thead>
<tr>
<th>PRODUCT STAGE</th>
<th>CONSTRUCTION STAGE</th>
<th>USE STAGE</th>
<th>END OF LIFE STAGE</th>
<th>BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>A2</td>
<td>A3</td>
<td>A4</td>
<td>A5</td>
</tr>
<tr>
<td>IN</td>
<td>IN</td>
<td>IN</td>
<td>MND</td>
<td>MND</td>
</tr>
</tbody>
</table>

**RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: Watertight Ready-mixed Concrete 1m³**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global warming potential</td>
<td>kg CO₂-Eq.</td>
<td>2.54E+2</td>
</tr>
<tr>
<td>Depletion potential of the stratospheric ozone layer</td>
<td>kg CFC11-Eq.</td>
<td>1.17E-8</td>
</tr>
<tr>
<td>Acidification potential of land and water</td>
<td>kg SO₂-Eq.</td>
<td>6.72E-1</td>
</tr>
<tr>
<td>Eutrophication potential</td>
<td>kg PO₄₃-Eq.</td>
<td>8.83E-2</td>
</tr>
<tr>
<td>Formation potential of tropospheric ozone photochemical oxidants</td>
<td>kg ethene-Eq.</td>
<td>6.66E-2</td>
</tr>
<tr>
<td>Abiotic depletion potential for non-fossil resources</td>
<td>kg Sb-Eq.</td>
<td>2.30E-4</td>
</tr>
<tr>
<td>Abiotic depletion potential for fossil resources</td>
<td>MJ</td>
<td>1.57E+3</td>
</tr>
</tbody>
</table>

**RESULTS OF THE LCA - RESOURCE USE: Watertight Ready-mixed Concrete 1m³**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable primary energy as energy carrier</td>
<td>MJ</td>
<td>9.67E+1</td>
</tr>
<tr>
<td>Renewable primary energy resources as material utilization</td>
<td>MJ</td>
<td>0.00E+0</td>
</tr>
<tr>
<td>Total use of renewable primary energy resources</td>
<td>MJ</td>
<td>9.67E+1</td>
</tr>
<tr>
<td>Non-renewable primary energy as energy carrier</td>
<td>MJ</td>
<td>1.89E+3</td>
</tr>
<tr>
<td>Non-renewable primary energy as material utilization</td>
<td>MJ</td>
<td>0.00E+0</td>
</tr>
<tr>
<td>Total use of non-renewable primary energy resources</td>
<td>MJ</td>
<td>1.89E+3</td>
</tr>
<tr>
<td>Use of secondary material</td>
<td>kg</td>
<td>1.94E+2</td>
</tr>
<tr>
<td>Use of renewable secondary fuels</td>
<td>MJ</td>
<td>3.01E+1</td>
</tr>
<tr>
<td>Use of non-renewable secondary fuels</td>
<td>MJ</td>
<td>1.21E+2</td>
</tr>
<tr>
<td>Use of net fresh water</td>
<td>[cr]</td>
<td>7.95E+1</td>
</tr>
</tbody>
</table>

**RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: Watertight Ready-mixed Concrete 1m³**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous waste disposed</td>
<td>kg</td>
<td>1.43E-2</td>
</tr>
<tr>
<td>Non-hazardous waste disposed</td>
<td>kg</td>
<td>5.53E+1</td>
</tr>
<tr>
<td>Radioactive waste disposed</td>
<td>kg</td>
<td>4.88E-2</td>
</tr>
<tr>
<td>Components for re-use</td>
<td>kg</td>
<td>IND</td>
</tr>
<tr>
<td>Materials for recycling</td>
<td>kg</td>
<td>IND</td>
</tr>
<tr>
<td>Materials for energy recovery</td>
<td>kg</td>
<td>IND</td>
</tr>
<tr>
<td>Exported electrical energy</td>
<td>MJ</td>
<td>IND</td>
</tr>
<tr>
<td>Exported thermal energy</td>
<td>MJ</td>
<td>IND</td>
</tr>
</tbody>
</table>

**References**

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin (pub.):
Generation of Environmental Product Declarations (EPDs):
[www.ibu-epd.de](http://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, August 2016

PCR Part B
Institut Bauen und Umwelt e.V., Berlin (pub.): Part B: Requirements on the EPD for Concrete components made of in-situ or ready-mixed concrete (July 2014)
BS EN 12390
Compressive strength of test specimens
Flexural strength of test specimens
Density of hardened concrete

BASF Life Cycle Analyzer
Life Cycle Analyzer version 1.0 developed by BASF
with support of thinkstep, 2015

GaBi 6
GaBi 6 dataset documentation of the software-system
and databases, LBP, University of Stuttgart and
thinkstep AG, Leinfelden-Echterdingen, 2014
http://documentation.gabi-software.com/

GaBi database
GaBi database 2014
http://database-
documentation.gabisoftware.com/support/gabi/

BASF 2011
BASF AG: Peer review of BASF Life Cycle Inventory
Method for X-SEED Concrete Admixture – Review
report prepared by DEKRA, February 2011

Bauchemie 2014
Deutsche Bauchemie e.V., EPDs for concrete
admixtures, IBU (Institut Bauen und Umwelt e.V.),
2014

REACH
Directive (EG) No. 1907/2006 of the European
Parliament and of the Council dated 18 December
2006 on the registration, evaluation, approval and
restriction of chemical substances (REACH), for
establishing a European Agency for chemical
substances, for amending Directive 1999/45/EC and
for annulment of Directive (EEC) No. 793/93 of the
Council, Directive (EC) No. 1488/94 of the
Commission, Guideline 76/769/EEC of the Council and
Guidelines 91/155/EEC, 93/67/EEC, 93/105/EC and
2000/21/EC of the Commission