Environmental Product Declaration

BREG EN EPD No.: 000002 Issue: 03

ECO EPD Ref. No.: 000092

This is to certify that this verified Environmental Product Declaration provided by:

The Brick Development Association

Is in accordance with the requirements of:

EN 15804:2012+A1:2013

This declaration is for:

BDA generic brick

Company Address

The Building Centre
26 Store Street
London
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Signed for BRE Global Ltd	Derek Hughes Operator	20 January 2015 Date of this Issue
12 December 2013 Date of First Issue		11 December 2018 Expiry Date

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EPD verification and LCA details

Demonstration of Verification	
CEN standard EN 15804 serves as the core PCR[a]	
Independent verification of the declaration and data according to EN ISO 14025:2010	
☐ Internal	☑ External
Third party verifier[b]: **Dr Owen Abbe**	
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)	

LCA Consultant	Verifier
Nigel Jones BRE Bucknalls Lane Watford WD25 9XX www.bre.co.uk	Dr Owen Abbe BRE Global Bucknalls Lane Watford WD25 9XX www.bre.co.uk

General Information

Summary

This environmental product declaration is for 1 tonne of BDA generic brick produced by The Brick Development Association at the following manufacturing facilities:

Wienerberger Ltd. Stubbers Green Road Aldridge Walsall, West Midlands WS9 8BJ UK	Hanson Building Products Ltd. Desford Works Heath Road Bagworth, Desford LE67 1DL UK	Ibstock Brick Ltd. Dorket Head Factory Arnold Nottingham NG5 8PZ UK
Wienerberger Ltd. Windmill Lane Denton Manchester WC1E 7BT UK	Hanson Building Products Ltd. Howley Park Factory Quarry Lane Woodkirk, Dewsbury WF12 7JJ UK	Ibstock Brick Ltd. Laybrook Factory Goose Green Lane Thakeham, Pulborough RH20 2LW UK
Wienerberger Ltd. Hartlebury Works Whitlenge Lane Hartlebury, Kidderminster DY10 4HB UK	The York Handmade Brick Company Winchester House Forest Lane, Alne York, North Yorkshire YO61 1TU UK	Ibstock Brick Ltd. Parkhouse Factory Speedwell Road Newcastle-under-Lyme, Staffordshire ST5 7RZ UK

This is a Cradle to gate with options EPD. The life cycle stages included are as shown below (X = included, MND = module not declared):

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction - Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water use	Deconstruction	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X		X

Programme Operator

BRE Global, Watford, Herts, WD25 9XX, United Kingdom
This declaration is based on the BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013

Comparability

Environmental declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A1:2013. Comparability is further dependent on the product category rules used and the source of the data, e.g. the database. See EN 15804:2012+A1:2013 for further guidance.

Construction Product:

Product Description

A brick is a block of ceramic material used in construction, usually laid using different kinds of mortar.

Most bricks are used in cavity walls in building projects. Bricks generally form the outside face of the wall. Bricks are also used fairfaced internally replacing the internal blockwork and plasterwork, and for both free standing walls and civil engineering structures.

The product content in the table below represents an average composition of 1 tonne of brick.

Technical Information

Property	Value	Unit
Size (typical)	215 x 102.5 x 65	mm
Voids	20	%
Weight (dry)	2.2	kg
Density (gross, dry)	1550	kg/m^3
Compressive strength	25	N/mm^2
Water absorbency (BS EN 771-2)	20	%
Equivalent Thermal Conductivity (K value) 5% exposed	1	W/(m.K)

Product Contents

Material/Chemical Input	%
Clay	86
Sand	12
Other additives and pigments	2

Manufacturing Process

There are 4 main manufacturing processes by which bricks are produced in the UK: extrusion, soft mud moulding, handmade moulding and semi-dry pressing. In the UK, ‘extrusion’ and ‘soft mud moulding’ are dominant.

Most UK clay types can be used, the harder less clay rich shales and marls lend themselves more to extraction with the more clay rich clays used in the soft mud process.

The extrusion process typically produces bricks with perforations within the body of the brick, ranging from highly perforated units through to the more traditional 3 and 10 holes. The perforations aid in the formation process of the bricks allowing the clay to be compressed in the extrusion die, however the main benefits come from the drying and firing process, where the additional voids within the bricks, not only reduce the amount of raw material in the brick, but also increases the surface area thus allowing from more efficient drying and firing.

Extrusion process is also often described as wire cut, as the column of clay is pushed out of the extrusion head the bricks are formed by a wire cutter normally cutting a number of bricks in the column. These bricks are then dried prior to entering the kiln for vitrifying which normally takes place at around 1000°C.

Soft mud bricks are typically ‘solid’ or ‘frogged’ in appearance. The ‘frog’ is the name given to the indentation typically on the upper bedface of the brick, and again reduces the amount of raw material in the brick, and increases the surface area, thus again aiding drying and firing. The frog also aids the structural performance when laid with mortar. Soft mud bricks or ‘stock’ bricks have higher water absorbency prior to being dried. The characteristic sanded face is part of the requirement to allow the green brick to be released from the mould.

The process flow diagram is shown below:

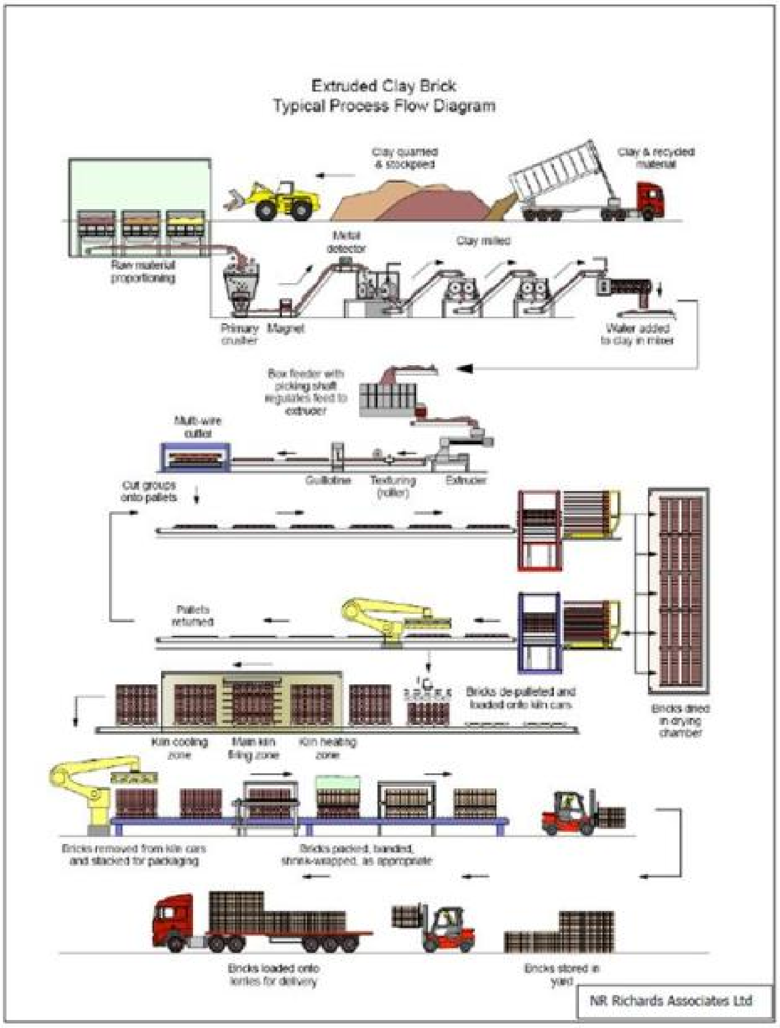

Figure A2: Typical process flow for the manufacture of extruded wire cut bricks

End of Life

Brick can be recovered from demolition for re-use in new buildings in appropriate way that is compatible with current building codes/regulations and maintains the 'embodied' value of the products by extending the 'service life' of the individual units.

Bricks can also be re-used as aggregates and as hardcore for below slab support and as a result, only a small proportion of bricks are disposed in landfill at end of life.

Life Cycle Assessment Calculation Rules

Declared / Functional unit

The declared unit is 1 tonne of brick.

System boundary

In accordance with the modular approach as defined in EN 15804:2012, this cradle-to-gate with options EPD includes the product stage (A1-A3), disposal at end of life (C4) and benefits and loads beyond the system boundary (D) information modules.

Data sources, quality and allocation

Manufacturing process data for the 12 month period 01/01/2005 to 31/12/2005 was provided by four BDA member companies across nine manufacturing locations for three brick 'types'. At the time of data collection, this accounted for around 70% of UK brick production. No allocation of materials, energy, waste and emissions was needed within the individual site datasets.

The creation of the BDA generic brick dataset required allocation. This allocation was by production output as a proportion of total output. All allocation procedures in the background datasets are according to BRE PCR PN514 and EN 15804.

Background LCI datasets are taken from the ecoinvent database v2.2 unless indicated otherwise. Where the creation of BRE background datasets was required, these were created from ecoinvent datasets. Modelling of the life cycle of BDA generic brick was performed using SimaPro 8 LCA software from PRé.

Cut-off criteria

All raw materials, packaging materials and consumable item inputs, and associated transport to the plant, process energy and water use, direct production waste and emissions to air and water are included.

LCA Results

(INA = Indicator not assessed, AGG = Aggregated, NA = Not Applicable)

Indicator	Unit	A1 Raw materials supply	A2 Transport to factory	A3 Manufacturing	A1-A3 Aggregateted	A4 Transport to site	A5 Construction - installation	B1 Use	B2 Maintenance	B3 Repair
Environmental impacts per declared/functional unit										
GWP	kg CO_2 eq.	AGG	AGG	AGG	158	INA	INA	INA	INA	INA
ODP	kg CFC 11 eq.	AGG	AGG	AGG	8.69E-05	INA	INA	INA	INA	INA
AP	kg SO_2 eq.	AGG	AGG	AGG	1.35	INA	INA	INA	INA	INA
EP	kg $(PO_4)^{3-}$ eq.	AGG	AGG	AGG	0.05	INA	INA	INA	INA	INA
POCP	kg C_2H_4 eq.	AGG	AGG	AGG	0.0751	INA	INA	INA	INA	INA
ADPE	kg Sb eq.	AGG	AGG	AGG	4.34E-07	INA	INA	INA	INA	INA
ADPF	MJ eq.	AGG	AGG	AGG	2840	INA	INA	INA	INA	INA
GWP = Global Warming Potential (Climate Change); ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels										
Resource use										
PERE	MJ	AGG	AGG	AGG	58.3	INA	INA	INA	INA	INA
PERM	MJ	AGG	AGG	AGG	INA	INA	INA	INA	INA	INA
PERT	MJ	AGG	AGG	AGG	58.3	INA	INA	INA	INA	INA
PENRE	MJ	AGG	AGG	AGG	2810	INA	INA	INA	INA	INA
PENRM	MJ	AGG	AGG	AGG	INA	INA	INA	INA	INA	INA
PENRT	MJ	AGG	AGG	AGG	2810	INA	INA	INA	INA	INA
SM	kg	AGG	AGG	AGG	21.4	INA	INA	INA	INA	INA
RSF	MJ	AGG	AGG	AGG	INA	INA	INA	INA	INA	INA
NRSF	MJ	AGG	AGG	AGG	163	INA	INA	INA	INA	INA
FW	m^3	AGG	AGG	AGG	0.759	INA	INA	INA	INA	INA
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 = Net use of fresh water										
Waste to disposal										
HWD	kg	AGG	AGG	AGG	1.60	INA	INA	INA	INA	INA
NHWD	kg	AGG	AGG	AGG	1.38	INA	INA	INA	INA	INA
TRWD	kg	AGG	AGG	AGG	0.00947	INA	INA	INA	INA	INA
RWDHL	kg	AGG	AGG	AGG	0.00102	INA	INA	INA	INA	INA
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; TRWD = Total Radioactive waste disposed; RWDHL = Radioactive waste disposed (high-level nuclear waste)										
Other output flows										
CRU	kg	AGG	AGG	AGG	INA	INA	INA	INA	INA	INA
MFR	kg	AGG	AGG	AGG	INA	INA	INA	INA	INA	INA
MER	kg	AGG	AGG	AGG	INA	INA	INA	INA	INA	INA
EE	MJ	AGG	AGG	AGG	1.24	INA	INA	INA	INA	INA
CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Export energy										

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LCA Results (continued)

(INA = Indicator not assessed, AGG = Aggregated, NA = Not Applicable)

Indicator	Unit	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse/ Recovery/ Recycling potential
Environmental impacts per declared/functional unit										
GWP	kg CO_2 eq.	INA	INA	INA	INA	INA	INA	INA	0.245	-1.65
ODP	kg CFC 11 eq.	INA	INA	INA	INA	INA	INA	INA	5.99E-07	-1.00E-06
AP	kg SO_2 eq.	INA	INA	INA	INA	INA	INA	INA	0.00186	-0.0321
EP	kg $(PO_4)^{3-}$ eq.	INA	INA	INA	INA	INA	INA	INA	0.000401	-0.00756
POCP	kg C_2H_4 eq.	INA	INA	INA	INA	INA	INA	INA	0.000238	-0.0381
ADPE	kg Sb eq.	INA	INA	INA	INA	INA	INA	INA	1.09E-10	-8.09E-10
ADPF	MJ eq.	INA	INA	INA	INA	INA	INA	INA	3.33	-21.7
GWP = Global Warming Potential (Climate Change); ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels										
Resource use										
PERE	MJ	INA	INA	INA	INA	INA	INA	INA	0.00746	-0.198
PERM	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
PERT	MJ	INA	INA	INA	INA	INA	INA	INA	0.00746	-0.198
PENRE	MJ	INA	INA	INA	INA	INA	INA	INA	3.29	-21.4
PENRM	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
PENRT	MJ	INA	INA	INA	INA	INA	INA	INA	3.29	-21.4
SM	kg	INA	INA	INA	INA	INA	INA	INA	INA	INA
RSF	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
NRSF	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
FW	m^3	INA	INA	INA	INA	INA	INA	INA	0.000315	-0.00106
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 = Net use of fresh water										
Waste to disposal										
HWD	kg	INA	INA	INA	INA	INA	INA	INA	8.96E-05	-0.00712
NHWD	kg	INA	INA	INA	INA	INA	INA	INA	100	49.9
TRWD	kg	INA	INA	INA	INA	INA	INA	INA	7.34E-05	-4.58E-04
RWDHL	kg	INA	INA	INA	INA	INA	INA	INA	9.59E-06	-5.98E-05
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; TRWD = Total Radioactive waste disposed; RWDHL = Radioactive waste disposed (high-level nuclear waste)										
Other output flows										
CRU	kg	INA	INA	INA	INA	INA	INA	INA	400	INA
MFR	kg	INA	INA	INA	INA	INA	INA	INA	500	INA
MER	kg	INA	INA	INA	INA	INA	INA	INA	INA	INA
EE	MJ	INA	INA	INA	INA	INA	INA	INA	0.0399	-0.249
CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Export energy										

Scenarios and Additional Technical Information

End-of-life modules – C1, C3, and C4			
Parameter	**Description**	**Unit**	**Value**
Waste for re-use	Brick from demolition for re-use	kg	400
Waste for recycling	Brick from demolition to recycling	kg	500
Waste for final disposal	Brick from demolition to landfill	kg	100

Module D – Reuse/Recovery/Recycling Potential
After demolition clay brick is crushed on site and re-used as a replacement for virgin aggregate in roadwork or used as a replacement for normal weight coarse aggregate in the manufacture of concrete blockwork. 1 tonne of crushed clay brick results in a (net) production of 950 kg of recycled aggregates with 50 kg to landfill from crushing. This recycled secondary aggregate can in turn replace 950 kg of virgin aggregate.

Interpretation

In the production phase (A1-A3), Global Warming Potential (Climate Change) (GWP), Ozone Depletion Potential (ODP), Acidification Potential (for Soil and Water) (AP), Eutrophication (EP) and Photochemical Ozone Creation Potential (POCP) result from emissions from process energy use, i.e. combustion of natural gas and electricity use, the upstream production of raw materials, and emissions from combustion of diesel in the transport of raw materials and site processes.

Abiotic Depletion Potential (Fossil fuels) (ADPF) shows the same trends as the other categories driven by the combustion of fossil fuels. Use of natural gas and grid electricity, diesel combustion in plant machinery, together with fossil fuel derived raw materials are the major contributors to depletion of fossil fuel resources.

The Abiotic Depletion Potential (Elements) (ADPE) impact category is related to extraction of virgin abiotic material from the environment, e.g. extraction of aggregates, metal ores, minerals, earth etc. The largest source of ADPE impacts is grid electricity use at plant and the use of electricity in the natural gas production processes. This impact is a direct result of the proportion of electricity generated from nuclear power that the UK grid electricity mix contains.

The environmental impacts from the end-of-life disposal scenario (C4) result only from the proportion of waste sent to landfill. With the exception of the ADPE and ADPF, all other impacts for the remaining impact categories (GWP, ODP, AP, EP and POCP) result from the associated emissions directly linked to fossil fuel consumption in landfill plant machinery. The ADPE and ADPF impacts result from the extraction, upstream processing of the diesel fuel used in landfill machinery (i.e. process electricity) together with grid electricity used directly at the landfill.

There is benefit in Module D associated with recycling of brick at end-of-life.

Sources of additional information

BRE Global. BRE Environmental Profiles 2013: Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013. PN 514. Watford, BRE, 2014.

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A1:2013. London, BSI, 2013.

BSI. Environmental labels and declarations – Type III Environmental declarations – Principles and procedures. BS EN ISO 14025:2010 (exactly identical to ISO 14025:2006). London, BSI, 2010.

BSI. Environmental management – Life cycle assessment – Principles and framework. BS EN ISO 14040:2006. London, BSI, 2006.

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