Marshalls
Bricks & Masonry

Environmental Product Declaration

Perforated Dense Facing Bricks

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*An EPD should provide current information and may be updated if conditions change. The stated validity is, therefore, subject to the continued registration and publication at www.environdec.com

Introduction.

This EPD provides environmental performance indicators for perforated dense facing bricks manufactured by Marshalls Bricks & Masonry in the UK. This is a cradle-to-gate EPD in accordance with the requirements of EN 15804, and thus covers the modules A1 - A3 defined in that standard. The EPD is based on a life cycle assessment (LCA) study which used production data covering the 12-month period from 02 April 2017 to 31 March 2018 from Marshalls Bricks & Masonry's manufacturing facility in Smalldale, near Buxton, in Derbyshire, UK. Background data were taken from the ecoinvent database (v3.4).

The EPD presents details of the LCA, a description of the product life cycle it covers, values for the environmental indicators specified by EN 15804 and a brief explanation of those results.
The declared unit is 1000 of Marshalls Bricks & Masonry's perforated dense facing bricks.
The equivalent mass is 2375kg +/- 3%.

Perforated Dense Facing Brick EPD	
EPD programme	The International EPD® System
EPD programme operator	EPD International AB - Stockholm - Sweden www.environdec.com
EPD owner	Marshalls Bricks & Masonry Danygraig Road, Risca, Newport NP11 6DP - UK www.marshalls.co.uk
Product name	Perforated dense facing bricks
CPC code	3754
Declared unit	1000 units
System boundaries	Cradle to factory gate (Modules A1 to A3)
Declaration No	S-P-03536
Date of publication	2021-04-22
EPD valid until	2026-04-21
EPD geographical scope	Europe

Perforated Dense Facing Brick EPD	
EPD based on Product Category Rules	The CEN standard EN 15804 serves as the core PCR
	The International EPD® System's PCR 2012:01 Construction Products and Construction Services, Version 2.33, 2020-09-18; SUB-PCR EN 16757:2017 "Sustainability of construction works - Environmental product declarations - PCR for concrete and concrete elements"
PCR review conducted by	The Technical Committee of the International EPD® System Chair: Massimo Marino; contact via info@environdec.com
Verification	Independent verification of this EPD and data, according to ISO 14025/2006: ✓external verification
Third party verifier	Dr Hudai Kara - Recognized Individual Verifier
Accredited or approved by	The International EPD® System
LCA conducted by	EuGeos Limited, UK - +44 (0)1625 434423 www.eugeos.co.uk

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

Company profile.

Marshalls Bricks and Masonry is the United Kingdom's largest manufacturer and supplier of concrete facing bricks, reconstituted walling stone and architectural cast stone. Operating from 10 manufacturing sites located throughout the country, our extensive range of products includes a comprehensive range of facing and utility bricks, reconstituted walling and both standard and bespoke architectural cast stone dressings. Formally Edenhall, Marshalls Bricks and Masonry has a long and experienced history of providing a high quality and value product for the application required.

As part of the Marshalls PLC, Marshalls Bricks and Masonry follows and adopts the same high standards and commitment to sustainability and protection of the environment, sourcing resources responsibly and operating in a manner in tune with the environment. Marshalls' sustainable business model combines key business issues and key performance indicators with third party verification, legislation and industry standards including ISO 14001 for Environmental Management and ISO 50001 for Energy Management. We care about the natural world and we recognise our responsibility to work within environmental limits. We understand the potential impacts of our operations, products and services. We seek to protect the environment, prevent pollution from our operations and to identify, understand and minimise significant environmental impacts where appropriate. As part of our commitment to reduce carbon emissions, Marshalls has had its emissions reduction targets approved by the Science Based Targets Initiative as consistent with levels required to meet the goals of the Paris Agreement. Find out more here: https://www.marshalls.co.uk/sustainability

In addition to our mandatory duty to report annually on our greenhouse gas emissions, Marshalls continues to report voluntarily to the Carbon Disclosure Project and in 2020, will progress our support for the Task Force on Climate-Related Financial Disclosures (TCFD) in line with the UK Government's expectation that listed companies should disclose in line with the TCFD recommendations by 2022.

Marshalls is a market leader, and operates as a responsible business. Marshalls are in support of human rights and equality. Marshalls are active in the elimination of discrimination in respect of employment and occupation. As members of the UNGC UK Modern Slavery Working Group, Marshalls continue to work hard with our suppliers, employees, UK and overseas governments, partners and communities to take action against the growing problem of modern slavery. Marshalls demonstrates high ethical standards and is actively anti-corruption and bribery.

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Product information.

Perforated Dense Facing Bricks

This EPD applies to the Peakdale range of bricks supplied by our Buxton Works which predominantly supplies product to the midlands and north of the country. The brick consists of limestone aggregates with portland cements with various proportions of oxide pigment and secondary processes providing a wide spectrum of colours and finishes to suit user requirements. The standard brick format is a rectangular cuboid with a declared size of 215x100x65mm; 3 slotted perforations and 2 voids to the rear pass through the bed face of the brick. The brick is intended for use in construction where the application requires a finished face directly from the brick masonry facade.

Marshalls Bricks and Masonry perforated dense facing bricks are concrete bricks for use in construction. Like all Marshalls Bricks & Masonry bricks, they comply with BS EN 771-3: 2011:+A1 2015 Specification for Masonry Units: Aggregate Concrete Masonry Units.

The bricks are manufactured to both high quality standard and to a keen quality system so as to maintain a consistent unit performance. The Peakdale facing brick is manufactured to achieve a mean air dried strength of 22.5N/mm^2 and has high durability equivalent to that of a clay facing brick class F2. There is no specific test for durability within BS EN771- 3:2011+A1:2015, with concrete bricks having a direct relationship between strength and durability. To confirm compliance with the F2 designation, the bricks are further tested beyond the requirement of BS771-3:2011+A1:2015 for durability performance based on the clay brick method described within BS EN 771-1: 2011:+A1 2015.

Perforated dense facing bricks produced by Marshalls Bricks and Masonry are classified CPC 3754 under the UN CPC classification system v2.1.

In this EPD, indicators are declared for three types of brick: white bricks, which are white or cream such as the example shown on the image to the left. Strong-coloured bricks which may be red-black, blue-black or dark grey like the brick shown on the image to the right.
Marshalls Bricks & Masonry's perforated dense facing bricks (reproduced with permission)

Manufacturing

Marshalls Bricks & Masonry manufactures dense perforated facing bricks at its facility in Smalldale, near Buxton (Derbyshire) in the UK.

Raw materials are delivered directly into storage silos that feed the production line. Brick production then involves the compaction of a semi-dry mix of graded limestone aggregate, cement, water, pigments and additives in a mould. “Green” or uncured bricks from the mould are transferred to an insulated chamber where they cure. A waterproof resin treatment is applied to the external finished faces.

Packaging

Cured bricks are packed, stretch hood wrapped and palletised. They then cure further in the stockyard until dispatched to customers.

Product Use and Maintenance

Once installed in a building, no maintenance of brickwork using concrete bricks should be expected for a minimum of 50 years. After this time, it would be normal for the re-pointing of the mortar between bricks to be addressed within the maintenance plan.

End-of-life

At end of life of brickwork containing concrete facing bricks, the brickwork can be dismantled, the bricks separated, cleaned and re-used. On demolition of the brickwork, the product can be crushed and re-used as aggregate in the manufacture of concrete products or as a bedding construction material. As wastes removed from a building, perforated dense facing bricks fall under European Waste Catalogue (EWC) code 17 01 02.

Reference Service Life

No reference service life is specified in this cradle-to-gate EPD.

A brick’s expected service life significantly exceeds the design life of the structure it is incorporated into and is predicted to be in excess of 100 years. The concrete facing brick is relatively young in terms of masonry components having been first introduced in the United Kingdom in or around the 1950s. There are significant numbers of these bricks within the current built environment.

Further Product Information

Detailed product information and data-sheets can be found

- On our website: www.marshalls.co.uk/commercial/bricks-walling
- Or by contacting us by telephone: +44 (0)1633 600 806
- Or by email: bricksbm@marshalls.co.uk

Content Declaration

The material composition of perforated dense facing bricks is shown below:

Materials	% Of mass per declared functional unit
Mineral aggregate	85 - 89
Cement	8 - 11
Water	2 - 4
Inorganic pigments	0 - 1
Polymers	<0.1

No substances included in the Candidate List of Substances of Very High Concern for authorisation under the REACH Regulations are present in the bricks, either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

Technical Data

Marshalls Bricks & Masonry's perforated facing bricks are concrete bricks for use in construction. Like all Marshalls Bricks & Masonry bricks, they comply with BS EN 771-3:2011+A1:2015 Specification for Masonry Units: Aggregate Concrete Masonry Units.

Technical properties are shown on the next page.

Name (test)	Value	Unit
Dimensions	215 x 100 x 65	mm
Configuration	3 vertical perforations	-
Tolerances	Category D1(+3-5mm in all directions)	-
Net dry density	1950 (average)	kg/m³
Dry weight	2.30 - 2.45	kg
Compressive strength (air dry)	>22.5 (mean)	N/mm²
Thermal conductivity (dry)	1.1	W/mK
Thermal conductivity (@3%)	1.24	W/mK
Thermal conductivity (@5%)	1.33	W/mK
Water absorption by capillarity	<85	$g/m^2/s^{0.5}$
Water absorption by weight	5-9% after 24 hours	-
Moisture movement	<0.45	mm/m
Water vapour (tabulated from EN 1745)	5/15	μ
Reaction to fire	Euro class A1	-
Shear bond strength (tabulated from EN 998-2: 2003, Annex C)	0.15	N/mm^2
Built wall weight (100mm wide unplastered single leaf wall)	175	kg/m^2

Residual Risks and Emergencies

There are no residual risks associated with the normal day-to-day use of Marshalls Bricks and Masonry's perforated dense facing bricks. Care must be taken that the bricks are laid correctly.

Environmental Performance-Related Information.

LCA Information

This section of the EPD records key features of the LCA on which it is based.

Scope

This cradle-to-gate EPD covers the production stage (modules A1-A3; see below), as permitted by EN 15804; modules A1-A3 are declared in aggregated form.

Product stage			**Const. process stage**		**Use stage**							**End of life stage**				**Benefits & loads beyond the system boundaries**
Raw material supply	Transport	Manufacturing	Transport to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport disposal	Waste disposal	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X: included in LCA; MND: module not declared or NR for not relevant

Declared Unit

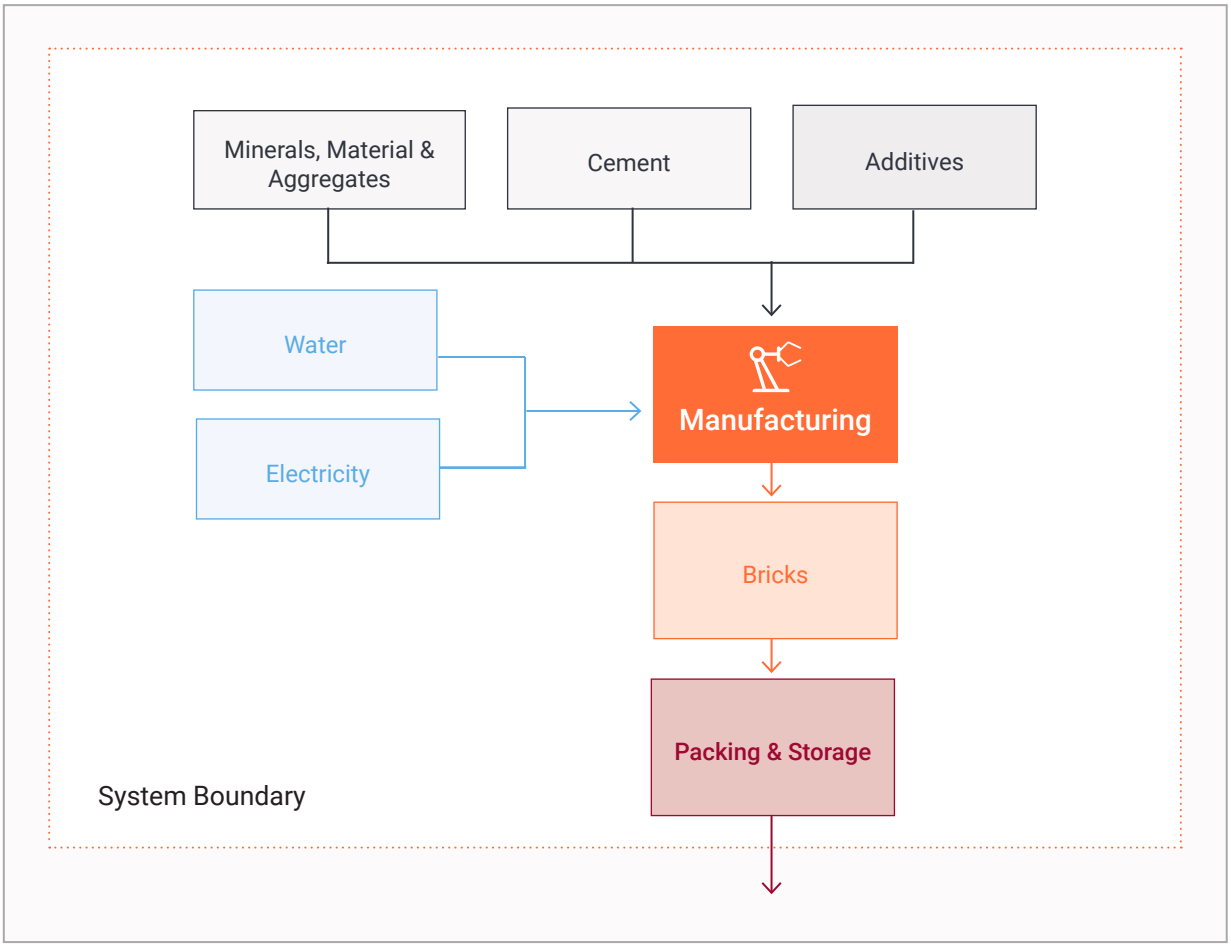
The declared unit is 1000 of Marshalls Bricks & Masonry's perforated dense facing bricks. The equivalent mass is 2375kg +/- 3%.

System Boundaries

The system boundary of the EPD is defined using the modular approach set out in EN 15804.
As well as the core processes which cover manufacture of the bricks at Marshalls Bricks & Masonry's Buxton site, the system therefore includes production of all raw materials and components from basic resources; transport of those materials at all stages up to Marshalls bricks & Masonry's Buxton site; the production of fuels and energy carriers and their delivery to manufacturing sites; the treatment of all wastes.

The upstream processing of recycled material inputs that have passed the end-of-waste state is outside the system boundary.

The product life cycle covered by this EPD is illustrated below.



Cut-Off Criteria

The collected data covered all raw materials, consumables and packaging materials; associated transport to the manufacturing site; process energy and water use; direct production wastes; emissions to air and water.

According to EN 15804 and the PCR, flows can be omitted (cut-off) from a core process in the LCA up to a maximum of 1% of the total mass of material inputs or 1% of the total energy content of fuels and energy carriers; transport of pigments to the port of landing meets these cut-off criteria and was omitted from the LCA underpinning this EPD.

Data Source & Data Quality

Data collected for the core processes (brick manufacturing) cover the period 02 April 2017 to 31 March 2018.

The producer-specific data used in LCA calculations are therefore based on 1 year averaged data and have been updated within the last 5 years. These data were checked to ensure that sufficient materials and water are included within the inputs to account for all products, wastes and emissions.

Background Data

Background (generic) data were taken from the ecoinvent database (v3.4); this fulfils the EN 15804 requirement that generic data used in the LCA have been updated within the last 10 years. Specific datasets were developed for specialty constituent materials. The quality of these data and the data characterising processes that contribute significantly to the overall LCA quality has been reviewed.

Other data were judged fit for purpose. No environmental impact potential stemming from proxy data exceeds 10% for any impact category.

Allocation

Brick manufacturing is a straightforward process. Common inputs (electricity, water and fuel for site vehicles) were allocated between perforated facing bricks and other cast concrete products made at the same site on the basis of production volume.

In the background data, the ecoinvent default allocation is applied to all processes except those in which secondary materials are used, where the “cut-off” allocation is applied. This ensures that secondary materials are free of upstream burdens that arise prior to their reaching the “end of waste” state, in accordance with Section 6.3.4.2 of EN 15804.

Assumptions & Estimates

Inputs to and outputs from the system are accounted for over a 100-year time period; long-term emissions are therefore omitted from the impact assessment part of the LCA.

The primary energy in materials indicators (PERM, PENRM) are calculated from calorific values (GCV if possible, for consistency with the CED method, NCV otherwise) of combustible constituents of the product itself. The energy content of wood used for product packaging is excluded from PERM calculations, because packaging are not part of the studied “construction product”. In this case, the only combustible constituent of the product is the resin applied to the outer face. Since this accounts for <0.1% of the total mass of a brick, and given that bricks are almost never incinerated when managed as waste, both PERM and PENRM indicators are assigned the value 0 as a realistic and reasonable approximation.

“Primary energy as fuel” indicators (PENRE, PERE) are calculated as the total primary energy demand minus primary energy used as material.

Environmental Indicators & Interpretation

Environmental indicator results for the A1 - A3 modules on an aggregated basis are shown in the 4 following tables for the declared unit of 1000 of Marshalls Bricks & Masonry’s perforated dense facing bricks. The equivalent mass is 2375kg +/- 3%. At the declared dry density of 1950kg/m3, 1000 bricks represent a volume of 1.2 m3 .

Environmental impacts	Unit	Modules A1 - A3		
		"white" bricks	"strong-coloured" bricks	"light-coloured" bricks
Global warming potential (GWP)	kg CO2-eq	4.43E+02	3.43E+02	3.11E+02
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11- eq	2.15E-05	2.26E-05	1.49E-05
Acidification potential of land and water (AP)	kg SO2-eq	9.38E-01	1.52E+00	7.10E-01
Eutrophication potential (EP)	kg PO43- -eq	1.38E-01	1.41E-01	1.10E-01
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg ethene- eq	4.05E-02	6.44E-02	3.23E-02
Abiotic depletion potential for non-fossil resources (ADPE)	kg Sb-eq	9.30E-04	1.37E-03	8.80E-04
Abiotic depletion potential for fossil resources (ADPFF)	MJ	2.13E+03	2.37E+03	1.92E+03

Resource use	Unit	Modules A1 - A3		
		"white" bricks	"strong- coloured" bricks	"light- coloured" bricks
Renewable primary energy as energy carrier (PERE)	MJ	7.39E+02	7.52E+02	7.22E+02
Renewable primary energy resources as material utilization (PERM)	MJ	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	**MJ**	**7.39E+02**	**7.52E+02**	**7.22E+02**
Non-renewable primary energy as energy carrier (PENRE)	MJ	2.38E+03	2.63E+03	2.14E+03
Non-renewable primary energy as material utilization (PENRM)	MJ	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary	**MJ**	**2.38E+03**	**2.63E+03**	**2.14E+03**
Use of secondary material (SM)	kg	7.39E+02	7.52E+02	7.22E+02
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF)	MJ	7.39E+02	7.52E+02	7.22E+02
Use of net fresh water (FW)	m^3	2.38E+03	2.63E+03	2.14E+03
Waste	**Unit**	**Modules A1 - A3**		
		"white" bricks	"strong- coloured" bricks	"light- coloured" bricks
Hazardous waste disposed (HW)	kg	6.71E-02	6.31E-02	5.61E-02
Non-hazardous waste disposed (NHW)	kg	6.28E+01	6.70E+01	6.24E+01
Radioactive waste disposed (RW)	kg	1.42E-02	1.15E-02	1.02E-02
Output flow	**Unit**	**Modules A1 - A3**		
		"white" bricks	"strong- coloured" bricks	"light- coloured" bricks
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	9.92E-03	1.26E-02	7.09E-03
Exported energy	MJ	8.67E-10	8.61E-10	8.56E-10

Interpretation

Cement production makes the dominant contribution to all indicators. White cement manufacture is reported to have lower yield and higher energy demand than normal cement production, reflected in higher indicator values for the “white” bricks. Production using white cement represents a minority of Marshalls Bricks and Masonry’s annual output: approximately 20%.

Pigment manufacture also contributes significantly to the indicators obtained for the strong-coloured bricks, even though pigments represent a small proportion of the brick’s mass.

Marshalls Bricks and Masonry’s own operations make only a small contribution to the indicator values reported in the tables above.

There are considerable uncertainties around the exact magnitude of embedded impacts associated with both the pigments used and white cement. These uncertainties feed through into the indicator values reported in this EPD.

For the ODP indicator, releases of CFC’s in generic LCA data representing upstream processes in the oil & gas sector account for the indicator values reported in this EPD. Some sources of this generic data predate Montreal Protocol deadlines for CFC phase-out. ODP indicator values should therefore be treated with caution.

Additional Environmental Information

Concrete bricks absorb carbon dioxide from the air in use and in later stages of the life cycle. These stages of the life cycle are not covered by this EPD, but the amount of CO2 absorbed by concrete can be calculated following the method in Annex BB of EN16757:2017.

References

BS EN 771-3: 2011: +A1:2015 - Specification for Masonry Units: Aggregate Concrete Masonry Units ecoinvent database (v3.3) - www.ecoinvent.ch

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

General Program Instructions, Version 3.0, 2017-12-11 - The International EPD® System

EPD International AB ISO 14001:2015 - Environmental management systems – Requirements with guidance for use.

ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

ISO 50001:2018 : Energy management systems

LCA of Perforated Dense Facing Bricks (2018) - Report for Marshalls Bricks & Masonry - EuGeos Limited

PCR 2012:01 Construction Products and Construction Services, Version 2.33, 2020-09-18 - The International EPD® System - EPD International AB

sub-PCR EN 16757:2017 Sustainability of construction works - Environmental product declarations - PCR for concrete and concrete elements - The International EPD® System - EPD International AB

Glossary

The International EPD® System: a programme for Type III environmental declarations, maintaining a system to verify and register EPD®s as well as keeping a library of EPD®s and PCRs in accordance with ISO 14025. (www.environdec.com)

Life cycle assessment (LCA): LCA studies the environmental aspects and quantifies the potential impacts (positive or negative) of a product (or service) throughout its entire life. ISO standards ISO 14040 and ISO 14044 set out conventions for conducting LCA.

REACH Regulation: REACH is the European Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals. It entered into force in 2007, replacing the former legislative framework for chemicals in the EU.

Science Based Target Initiative is a joint initiative of CDP, the UN Global Compact (UNGC), the World Resources Institute (WRI) and WWF.