LIFE CYCLE

assessment

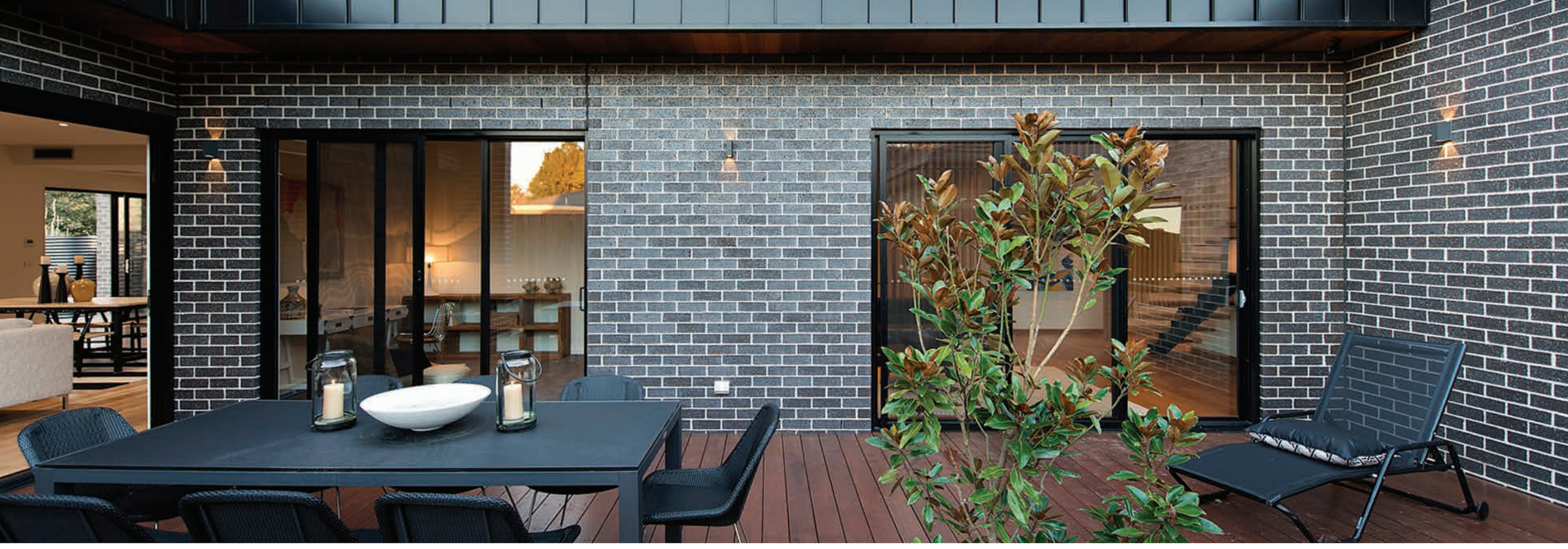
australbricks®

LIFE CYCLE *assessment*

Prepared in accordance with ISO 14025 and EN15804 for:

Bricks Produced by Austral Bricks Tasmania

Date of Issue:	13 March 2019
Geographical scope:	Australia, New Zealand, Japan, Republic of Korea



the COMPANY

Brickworks Ltd (Brickworks) was established in 1934 and is one of Australia's largest building products suppliers and manufacturers.

Brickworks has been transformed from originally a New South Wales state based operation to a national organisation with manufacturing operations in NSW, Victoria, Tasmania, South Australia, Western Australia and Queensland. Austral Bricks is a subsidiary of Brickworks. Austral Bricks was established in 1908, it manufactures and markets clay bricks and pavers.

Austral Bricks Tasmania is located in Longford, 20km south of Launceston. It produces a range of sustainable bricks and pavers for the Tasmanian, Australian and overseas markets. Bricks manufactured at the Longford factory are certified carbon neutral under the National Carbon Offset Standard (NCOS). The range achieved carbon neutrality by reducing emissions through efficiency improvements, using biomass as the kiln's major fuel source and offsetting the remaining emissions.

The facility manufactures durable and sustainable clay bricks and pavers for its local, national and international customer base. All bricks and pavers produced by Austral Bricks Tasmania are certified carbon neutral under NCOS, with the certification boundary encompassing the complete life cycle, from raw material extraction to end of life (cradle to grave).

Austral Bricks Tasmania operates in accordance with environmental best practice, environmental legislation, licences and permits; and its environmental and quality management systems which are designed to meet the requirements of ISO 14001 and ISO 9001.

Austral Bricks manufacturing operations are continually upgraded and modernised, implementing the world's best technology and environmental protection features. The Company's mission as per the Environmental Policy is to establish, operate and rehabilitate Brickworks sites in a manner that promotes optimum environmental outcomes.

More information:

http://brickworks.com.au

http://buildforliving.com.au

http://australbricks.com.au

http://bbp.style/PUBLIC/products/brochures australbricks/AB-Bricks-CarbonNeutralBrochure-NAT.pdf

http://bbp.style/PUBLIC/products/brochures/danielrobertson/DR-Bricks-Daniel-RobertsonBrochure-NAT.pdf

http://www.environment.gov.au/climate-change/government/carbon-neutral/certified-businesses/austral-bricks

our PRODUCTS

This Life Cycle Assessment (LCA) was prepared in-line with the Australasian Environmental Product Declarations System however it has not been registered. It covers the brick range produced by Austral Bricks Tasmania (Table 2). The assessed product range of Austral Bricks consists of facing bricks, which are suitable for cladding on walls. Austral Bricks' products contribute physically and structurally to the building, but also add to the aesthetic qualities of the building.

The LCA reports on four product groups, with results shown for representative products listed in Table 1. The groups collects bricks with the same dimensions. The representative products were selected for having the highest sales volumes.

The product Life Cycle Assessment (LCA) results within each group span more than 10% among the products. This is due to the composition mix, the density of bricks and domestic versus international distribution.

Table 2 – Products included in this LCA.

Representative product	Range	Product name	Product code	Production volume (% w/w)
None – No other products with same dimensions	BLOCKS	Render Blocks	71851-1	100%
DR 50 mm Hawthorn Black	DR 50 mm	Buff	71957-1	5%
	DR 50 mm	Apricot	71958-1	5%
	DR 50 mm	Hawthorn Black	71950-1	44%
	DR 50 mm	London Blend	71953-1	15%
	DR 50 mm	Hawthorn Tan	71955-1	23%
	DR 50 mm	Red Blend	71951-1	7%
DR Hawthorn Black (inc. Stretcher/left/right plinths/squints)	BLOCKS	Universal Commons C/H Grey Blend, Flintstone Pink, H/S Nevada, Symmetry Grey, Symmetry Pink Flash, Symmetry Grey Flash	71154-1/71312-11/71336-/71343-1/71350-1/71352-1/71377-1	2%
	COACH HOUSE	Centennial Blend (inc. Squints, Sills)	71301-1/71482-1	4%
	COACH HOUSE	Cream (incl. Squints, Sills)	71304-1/71483-1/71332-1/71357-1	3%
	COACH HOUSE	Killarney (incl. Flash, Sills)	71308-1/71318-1	2%
	COACH HOUSE	Commons/Commons Extruded	71316-2/71399-3	1%
	COACH HOUSE	Cream Solids	71371-1/71744-9	0%
	COACH HOUSE	Red, Burgundy, Dominion Red, Dominion Heritage Red (incl. Squints), Flintstone Red/Blue, Symmetry Red	71302-1/71480-1 /71310-1/71329-1/71327-1/71333-1/71375-1	2%
	COACH HOUSE	Tan (incl. Squints), Symmetry Tan	71306-1/71481-1/71353-1	3%
	COACH HOUSE	Red Solids, Lunar Solid	71749-9/71747-9	0%

Table 2 – Products included in this EPD. Continued.

Representative product	Range	Product name	Product code	Production volume (% w/w)
	DR	Cambridge	71904-1	1%
	DR	Dulwich Grey (incl. export solids)	71906-1	2%
	DR	Buff	71907-1	1%
	DR	Apricot	71908-1	1%
	DR	Trial	71723-1	0%
	DR	Hawthorn Black (inlc. Stretcher/left/right plinths/squints	71900-1	10%
	DR	London Blend	71903-1	5%
	DR	Hawthorn Black Solids	71980-1	0%
	DR	London Blend Solids	71983-1	0%
	DR	Red Blend (incl. solids, Red Blend Export)	71901-1	2%
	DR	Hawthorn Red (incl. Squints)	71902-1	2%
	DR	Hawthorn Tan (incl. Squints, Plinths)	71905-1	5%
	ELEMENTS	Graphite (incl. Flash)	71145-1	6%
	ELEMENTS	COMMONS	71145-2	2%
	ELEMENTS	Zinc	71146-1	4%
	ELEMENTS	Mercury (incl. Flash)	71147-1	1%
	EXPORT 110mm	C/H Cream, Silver Sands	71304-9/71357-9	1%
	EXPORT 110mm	C/H Grey	71303-9	0%
	EXPORT 110mm	C/H Pink (incl.	71305-9	0%
	EXPORT 110mm	C/H Pink Solids	71370-9	0%
	EXPORT 110mm	C/H Red	71302-9/71310-9	0%
	HOMESTEAD	Killarney (incl. Sill, Flash)	71326-1/71339-1	1%
	HOMESTEAD	Cream (Mayfair, incl. squints)	71342-1	2%
	HOMESTEAD	Centennial Blend (incl. Squints and Sills)	71346-1	1%
	HOMESTEAD	Cream Solids	71442-1	0%
	HOMESTEAD	Grey	71334-1	0%
	HOMESTEAD	Red (incl squints and sills)	71340-1	2%
	HOMESTEAD	Tan (incl. Squints, Sill)	71341-1	3%
	YARRA	Toorak Solids	71445-1	0%
	YARRA	Fitzroy/Primrose- 76mm	71178-1/71356-1	2%
	YARRA	Toorak- 76mm (incl. Squints, Sills)	71179-1	5%
	YARRA	Parkville - 76mm	71186-1	2%
	YARRA	Essendon- 76mm	71181-1	7%
	YARRA	Richmond- 76mm	71184-1	4%
	YARRA	Burnley (incl. Sills, Squints)	71185-1/71331-1	9%
	YARRA	Richmond Solids	71495-1	0%
Export 70mm C/H Grey	YARRA	Burnley Solids	71496-1	0%
	EXPORT 70mm	C/H Autumn Blend	71700-9	31%
	EXPORT 70mm	C/H Centennial Blend	71701-9	6%
	EXPORT 70mm	C/H Red	71702-9/71738-9/71737-9/71698-9	21%
	EXPORT 70mm	C/H Grey	71703-9	38%
	EXPORT 70mm	C/H Tan	71706-9	2%

Table 1 – Representative products.

Dimension group	Representative product range and name
23×11×16.2cm	Blocks: Render
23×11×5cm	DR 50mm: Hawthorn Black
23×11×7.6cm	DR: Hawthorn Black (inlc. Stretcher/left/right plinths/squints
23×7×7.6cm	Export: C/H Grey

Table 3 - Product characteristics of bricks produced by Austral Bricks Tasmania.

Technical specification	Test Result	Test method	Justification (if not compliant)
Gross density		AS/NZS4456.8:2003	
Percentage of voids	<30%	AS/NZS4456.7:2003	
Compressive strength	>10MPa	AS/NZS4456.4:2003	
Thermal conductivity	As specified in NCC (Thermal conductivity of 0.55-0.78W/m.K		It is specified in the NCC (National Construction Code) as a default value therefore no measurement is usually conducted
Sound insulation capacity	As specificied in NCC	ISO 140-3 ISO 717-1 for reference value Or AS/NZS1276.1 as specified in NCC	
Water absorption	<15%	AS/NZS4456.14:2003	

PRODUCT LIFE CYCLE

overview

The life cycle of a building product is divided into three process modules according to the General Program Instructions (GPI) of the Australasian EPD Programme (AEPDP, 2015) and four information modules according to ISO 21930 and EN 15804. The scope of the LCA is "cradle to gate with options" as defined by EN 15804 – the specific system boundary is shown in Figure 1.

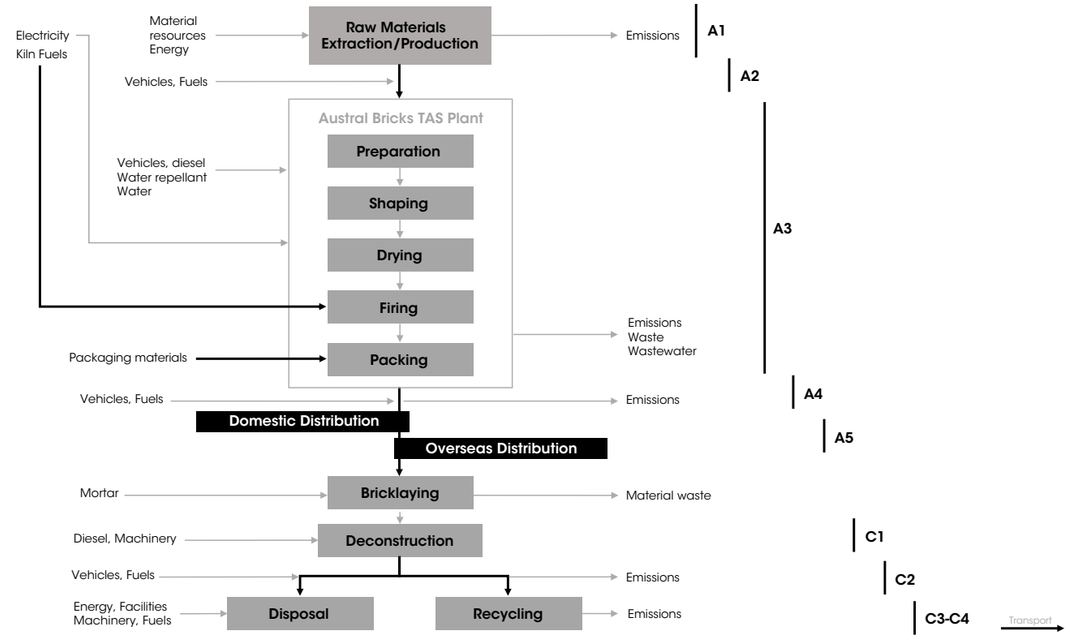
Table 4 - System boundary and scope of the study.

Product Stage			Construction Stage		Use Stage							End of Life stage				Benefits & Loads Beyond the System Boundary
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw Material Supply	Transport	Manufacturing	Transport	Installation	Material Emissions	Maintenance	Repair	Replacement	Refurbishment	Operational Energy	Operational Water	Deconstruction/demolition	Transport	Waste processing	Disposal	Reuse/Recycling/Recovery Potential
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	MND

X = module included in EPD

MND= module not declared (does not indicate zero impact result) – see text above table for explanation.

Figure 1 - Life cycle diagram of AUSTRAL BRICKS products.



Austral Bricks Tasmania products manufacturing

Austral Bricks Tasmania operates in Longford, Tasmania. Natural clay minerals, including shale, make up the main body of brick. Small amounts of manganese and other additives (sawdust, coal) are blended with the clay to produce different colours. Production waste (brick batts) is ground and recycled back into the clay mixture, resulting in a situation where no production waste leaves the Longford facility.

A variety of coating materials and methods are used to produce brick of a certain colour or surface texture. To create a typical coating, sand is mechanically mixed with some type of colorant (e.g. manganese, red oxide, char, sawdust, etc.). Sometimes frit (a glass containing colorant) is added to produce surface textures.

The initial step in producing bricks is crushing, followed by grinding. The raw materials are crushed by a crusher and then go through a pan mill for grinding. Particle size is controlled by a screen installed in the grinding machinery. The raw materials are mixed homogeneously in the crushing and milling process. Next, the blend of ingredients desired for each particular batch is sent on to the brick shaping processes (extrusion). Once the bricks are formed, they are dried to remove excess moisture that might otherwise cause an explosion during the ensuing firing process. The bricks are fired in a tunnel kiln and then cooled. The Longford plant uses mainly sawdust to fire the kiln.

Finally, they are dehacked, stacked on pallets, wrapped with plastic strap, plastic corner protectors and occasionally shrink film.

Distribution Stage and Construction

Packaged bricks are transported by road to Tasmanian customers, and by ship to other Australian states, Yokohama (Japan), Pusan (Korea) and Auckland (New Zealand).

Use Stage

Clay bricks are a popular building material because of their long lifespan and minimal maintenance requirements. Bricks are are strong, durable and can resist extreme weather events. When used in conjunction with good solar passive design and insulation, heating and cooling requirements can be significantly reduced (Think Brick, 2018).

Brick and mortar surfaces are considered to have no emissions associated with their use, because bricks are inert.

End of Life and Recycling

Bricks can be reused by salvaging from demolition and renovation works. Used bricks can be cleaned and used in new buildings. They can also be recycled by processing into new building materials such as aggregate for concrete, pavement for roads or landscaping material. This study assumes a recycling rate of 70% (Randell, Paul; Pickin, Joe; Grant, Bill, 2014), with the remaining share being landfilled.

LIFE CYCLE ASSESSMENT

methodology

This section includes the main details of the LCA study as well as assumptions and methods of the assessment.
A summary of the life cycle assessment parameters is given in Table 2.

Table 5 - Details of LCA.

Declared unit	**1 m2 of covered surface with brick and mortar**
Geographical coverage	**Australia, New Zealand, Japan and Republic of Korea**
LCA scope	**Cradle to gate with options**

Allocation

Allocation was carried out in accordance with the Product Category Rules (PCR) (EPD International, 2017).
No allocation between co-products in the core module as there were no co-products created during manufacturing. Energy consumed in core module was allocated to bricks via total annual production of each product.

CONTENT DECLARATION

Table 6 - Content declaration.

Material	Percentage Content	CAS No.
QUARTZ (CRYSTALLINE SILICA)	0.1 to 60%	14808-60-7
ALUMINO SILICATE	>10%	1318-02-1
NON-HAZARDOUS INGREDIENTS	Remainder	Not Available
METAL OXIDE(S)	1 to 10%	1 to 10%

ENVIRONMENTAL PERFORMANCE

The environmental information results for Austral Bricks Tasmania products are shown in Table 7 to Table 10.

Table 7 - Environmental information for 1 m² wall covered with mortar and brick by Blocks Render.

Impact Category Potential Environmental Impacts	A1-A3	A4	A5	C1	C2	C3	C4
Global warming (kg CO_2 eq)	7.251	13.476	11.161	0.009	0.943	0.001	0.726
Ozone depletion (kg CFC11 eq)	7.880E-07	3.943E-03	1.240E-03	1.725E-06	2.648E-04	5.421E-07	1.817E-04
Acidification of land and water (kg SO_2 eq)	1.538E-02	6.513E-02	3.298E-02	6.815E-05	4.039E-03	3.608E-06	2.952E-03
Eutrophication (kg PO_4^{3-} eq)	2.885E-02	1.255E-02	4.378E-03	1.485E-05	8.503E-04	4.957E-07	6.456E-04
Photochemical ozone creation (kgC_2H_2 eq)	6.616E-03	4.598E-05	6.408E-06	1.900E-09	3.333E-06	2.763E-09	2.971E-06
Depletion of abiotic resources (elements) (kg Sb eq)	6.40E-06	3.943E-03	1.240E-03	1.725E-06	2.648E-04	5.421E-07	1.817E-04
Depletion of abiotic resources (fossil) (MJ)	102.430	193.867	99.553	0.124	13.622	0.017	10.510
Use of Resources							
Renewable primary energy (excl. raw materials) (MJ)	707	1.439	7.529	0.000	0.100	0.000	0.127
Renewable primary energy (raw materials) (MJ)	1.454	0.000	0.000	0.000	0.000	0.000	0.000
Total use of renewable primary energy (MJ)	708.68	1.439	7.529	0.000	0.100	0.000	0.127
Non-renewable primary energy (excl. raw materials) (MJ)	107.006	190.757	68.724	0.130	13.427	0.011	10.944
Non-renewable primary energy (raw materials) (MJ)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total use of non-renewable primary energy (MJ)	107.0	190.757	68.724	0.130	13.427	0.011	10.944
Use of secondary material (kg)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Use of renewable secondary fuels (MJ)	0.033	0.043	0.000	1.067	0.913	0.000	0.000
Use of non-renewable secondary fuels (MJ)	16.263	3.843	0.000	44.988	39.846	0.000	0.302
Use of net fresh water (m^3)	0.021	6.468E-02	2.964E-02	2.232E-05	4.631E-03	7.029E-06	3.446E-03
Waste Categories							
Hazardous waste disposed (kg)	1.708E-04	2.391E-04	3.274E-05	5.677E-08	1.720E-05	8.793E-08	1.144E-05
Non-hazardous waste disposed (kg)	0.462	1.284	0.407	0.000	0.093	0.000	36.273
Radioactive waste disposed/stored (kg)	6.261E-07	9.547E-07	2.594E-07	4.140E-10	6.850E-08	2.600E-10	2.471E-07
Components for reuse (kg)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Materials for recycling (kg)	0.000	0.000	0.000	0.000	0.000	4.227	0.000
Materials for energy recovery (kg)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Exported energy (MJ)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 8 - Environmental information for 1 m² wall covered with mortar and brick for bricks with dimensions 23×11×5, represented by product DR 50mm Hawthorn Black.

Impact Category Potential Environmental Impacts	A1-A3	A4	A5	C1	C2	C3	C4
Global warming (kg CO_2 eq)	13.025	11.992	13.759	0.009	0.840	0.001	0.689
Ozone depletion (kg CFC11 eq)	7.778E-07	1.407E-06	4.651E-07	1.084E-09	9.948E-08	3.880E-11	5.787E-08
Acidification of land and water (kg SO_2 eq)	1.479E-02	3.509E-03	1.546E-03	1.725E-06	2.360E-04	5.145E-07	1.725E-04
Eutrophication (kg PO_4^{3-} eq)	3.711E-02	5.796E-02	4.130E-02	6.815E-05	3.599E-03	3.425E-06	2.802E-03
Photochemical ozone creation (kgC_2H_2 eq)	9.026E-03	1.117E-02	5.402E-03	1.485E-05	7.579E-04	4.704E-07	6.127E-04

Impact Category Potential Environmental Impacts	A1-A3	A4	A5	C1	C2	C3	C4
Depletion of abiotic resources (elements) (kg Sb eq)	2.141E-05	4.092E-05	7.056E-06	1.900E-09	2.971E-06	2.622E-09	2.820E-06
Depletion of abiotic resources (fossil) (MJ)	169.328	172.518	122.212	0.124	12.141	0.016	9.975
Use of Resources							
Renewable primary energy (excl. raw materials) (MJ)	588.746	1.280	5.865	0.000	0.089	0.000	0.120
Renewable primary energy (raw materials) (MJ)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total use of renewable primary energy (MJ)	588.746	1.280	5.865	0.000	0.089	0.000	0.120
Non-renewable primary energy (excl. raw materials) (MJ)	141.956	169.750	84.869	0.130	11.967	0.011	10.387
Non-renewable primary energy (raw materials) (MJ)	0.350	0.000	0.000	0.000	0.000	0.000	0.000
Total use of non-renewable primary energy (MJ)	142.306	169.750	84.869	0.130	11.967	0.011	10.387
Use of secondary material (kg)	7.829	0.000	0.000	0.000	0.000	0.000	0.000
Use of renewable secondary fuels (MJ)	1.349	0.038	1.262	0.000	0.000	0.000	0.000
Use of non-renewable secondary fuels (MJ)	39.072	3.420	55.263	0.501	0.000	0.013	0.000
Use of net fresh water (m^3)	0.045	0.058	0.036	0.000	0.004	0.000	0.003
Waste Categories							
Hazardous waste disposed (kg)	1.759E-04	2.128E-04	3.948E-05	5.677E-08	1.533E-05	8.346E-08	1.086E-05
Non-hazardous waste disposed (kg)	1.233	1.143	0.413	0.000	0.083	0.000	34.429
Radioactive waste disposed/stored (kg)	1.219E-06	8.496E-07	2.934E-07	4.140E-10	6.106E-08	2.468E-10	2.346E-07
Components for reuse (kg)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Materials for recycling (kg)	0.000	0.000	0.000	0.000	0.000	1.865	0.000
Materials for energy recovery (kg)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Exported energy (MJ)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 9 - Environmental information for 1 m² wall covered with mortar and brick for bricks with dimensions 23×11×7.6, represented by product DR Hawthorn Black.

Impact Category Potential Environmental Impacts	A1-A3	A4	A5	C1	C2	C3	C4
Global warming (kg CO_2 eq)	15.285	14.394	12.618	0.009	1.008	0.001	0.786
Ozone depletion (kg CFC11 eq)	9.353E-07	1.689E-06	4.263E-07	1.084E-09	1.193E-07	4.427E-11	6.603E-08
Acidification of land and water (kg SO_2 eq)	0.018	4.211E-03	1.418E-03	1.725E-06	2.829E-04	5.871E-07	1.968E-04
Eutrophication (kg PO_4^{3-} eq)	0.043	6.957E-02	3.785E-02	6.815E-05	4.315E-03	3.908E-06	3.197E-03
Photochemical ozone creation (kgC_2H_2 eq)	0.011	1.341E-02	4.955E-03	1.485E-05	9.085E-04	5.368E-07	6.992E-04
Depletion of abiotic resources (elements) (kg Sb eq)	2.602E-05	4.911E-05	6.511E-06	1.900E-09	3.561E-06	2.992E-09	3.217E-06
Depletion of abiotic resources (fossil) (MJ)	204.224	207.069	112.109	0.124	14.554	0.018	11.382
Use of Resources							
Renewable primary energy (excl. raw materials) (MJ)	709.300	1.537	5.513	0.000	0.106	0.000	0.137
Renewable primary energy (raw materials) (MJ)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total use of renewable primary energy (MJ)	11.375	1.537	5.513	0.000	0.106	0.000	0.137
Non-renewable primary energy (excl. raw materials) (MJ)	72.448	203.747	77.844	0.130	14.346	0.012	11.852
Non-renewable primary energy (raw materials) (MJ)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total use of non-renewable primary energy (MJ)	72.968	203.747	77.844	0.130	14.346	0.012	11.852
Use of secondary material (kg)	9.867	0.000	0.000	0.000	0.000	0.000	0.000

Impact Category Potential Environmental Impacts	A1-A3	A4	A5	C1	C2	C3	C4
Use of renewable secondary fuels (MJ)	1.610	0.046	1.159	0.000	0.000	0.000	0.000
Use of non-renewable secondary fuels (MJ)	46.166	4.105	50.677	0.501	0.000	0.328	0.000
Use of net fresh water (m^3)	0.041	0.069	0.033	0.000	0.005	0.000	0.004
Waste Categories							
Hazardous waste disposed (kg)	2.123E-04	2.554E-04	3.628E-05	5.677E-08	1.838E-05	9.523E-08	1.239E-05
Non-hazardous waste disposed (kg)	1.489	1.372	0.397	0.000	0.099	0.000	39.285
Radioactive waste disposed/stored (kg)	1.516E-06	1.020E-06	2.703E-07	4.140E-10	7.319E-08	2.816E-10	2.676E-07
Components for reuse (kg)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Materials for recycling (kg)	0.000	0.000	0.000	0.000	0.000	2.689	0.000
Materials for energy recovery (kg)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Exported energy (MJ)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 10 - Environmental information for 1 m² wall covered with mortar and brick for bricks with dimensions 23×7×7.6, represented by product Export C/H Grey.

Impact Category Potential Environmental Impacts	A1-A3	A4 - Asia	A5	C1	C2	C3	C4	
Global warming (kg CO_2 eq)	5.748	31.328	27.849	9.903	0.009	0.568	0.001	0.471
Ozone depletion (kg CFC11 eq)	4.913E-07	0.000	0.000	3.328E-07	1.084E-09	6.719E-08	2.655E-11	3.960E-08
Acidification of land and water (kg SO_2 eq)	9.300E-03	0.019	0.017	1.109E-03	1.725E-06	1.594E-04	3.521E-07	1.180E-04
Eutrophication (kg PO_4^{3-} eq)	22.079E-02	0.297	0.235	2.966E-02	6.815E-05	2.431E-03	2.343E-06	1.917E-03
Photochemical ozone creation (kgC_2H_2 eq)	4.514E-03	0.032	0.027	3.880E-03	1.485E-05	5.118E-04	3.219E-07	4.193E-04
Depletion of abiotic resources (elements) (kg Sb eq)	6.647E-06	0.000	0.000	5.091E-06	1.900E-09	2.006E-06	1.794E-09	1.929E-06
Depletion of abiotic resources (fossil) (MJ)	71.88	369.098	324.069	87.916	0.124	8.200	0.011	6.825
Use of Resources								
Renewable primary energy (excl. raw materials) (MJ)	432	438.656	438.190	4.46	0.0004	0.060	0.0002	0.082
Renewable primary energy (raw materials) (MJ)	432.117	438.656	438.190	4.455	0.000	0.060	0.000	0.082
Total use of renewable primary energy (MJ)	0.706	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Non-renewable primary energy (excl. raw materials) (MJ)	432.822	438.656	438.190	4.455	0.000	0.060	0.000	0.082
Non-renewable primary energy (raw materials) (MJ)	69.553	329.149	286.879	60.958	0.130	8.082	0.007	7.107
Total use of non-renewable primary energy (MJ)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Use of secondary material (kg)	69.553	329.149	286.879	60.958	0.130	8.082	0.007	7.107
Use of renewable secondary fuels (MJ)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Use of non-renewable secondary fuels (MJ)	0.280	1.041	0.768	1.159	0.000	0.000	0.000	0.000
Use of net fresh water (m^3)	46.166	92.840	68.475	50.677	0.501	0.000	0.196	0.000
Waste Categories								
Hazardous waste disposed (kg)	1.09E-04	2.61E-04	2.41E-04	2.83E-05	5.68E-08	1.04E-05	5.71E-08	7.43E-06
Non-hazardous waste disposed (kg)	0.430	24.841	24.749	0.296	0.000	0.056	0.000	23.557
Radioactive waste disposed/stored (kg)	4.89E-07	1.39E-06	1.29E-06	2.12E-07	4.14E-10	4.12E-08	1.69E-10	1.60E-07
Components for reuse (kg)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Materials for recycling (kg)	0.000	0.000	0.000	0.000	0.000	0.000	1.613	0.000
Materials for energy recovery (kg)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Exported energy (MJ)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

interpretation of
LCA RESULTS

The LCA have established that:

- One life cycle stage cannot be singled out as the main cause of environmental impact. These are overall evenly distributed between the cradle-to-gate stage, distribution and construction.
- Up to the factory gate, the main sources of impacts and energy use are kiln fuels, particularly natural gas.
- Brick raw materials have relatively low importance to impacts, resource use and waste disposal. Their absolute impact depends on the use of additives, since clay and shales have negligible impact.
- The importance of distribution is due to the long distances traveled by the bricks resulting from Austral Bricks' extensive market coverage.
- The impact of bricklaying is due to the use of mortar. This LCA took a conservative approach in the choice of mortar type, as demonstrated in the sensitivity analysis. Different mortar types will have overall lower impacts.

INDEPENDANT
verification information

Product Category Rules:	PCR 2012:01 Construction Products and Services, Version 2.1, 2017-01-04
Product group classification:	UN CPC 54
Reference year for data:	2016
Geographical scope:	Australia, New Zealand, Japan and Republic of Korea

Product category rules (PCR):

PCR 2012:01 Construction Products and Services, Version 2.1, 2017-01-04

PCR review was conducted by:

IVL Swedish Environmental Research Institute

Moderator: Martin Erlandsson, martin.erlandsson@ivl.se

Independent verification of the declaration and data, according to ISO 14025:2006:

Third party verifier:

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Mandatory statements

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

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Brickworks Building Products is one of Australia's largest and most diverse building material manufacturers. Under the Brickworks Building Products umbrella are some of Australia's best known building materials brands. Our products include bricks, pavers, masonry blocks, retaining wall systems, precast concrete panels, concrete and terracotta roof tiles, timber products, terracotta façades and specialised building systems.

With a broad product portfolio and manufacturing and sales facilities across Australia, Brickworks Building Products is uniquely placed to service the demands of the building industry.

With over 1,200 staff across Australia and New Zealand, we pride ourselves on our commitment to product, service excellence and our leadership position.

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Opposite: Bowral 50 + 76 *Simmental Silver*
Architect: Blight Rayner in association with Twofold Studio
Photographer: Christopher Frederick Jones

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Perth
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Hobart
TAS 7000

Austral Bricks, Bowral Bricks, Daniel Robertson and Nubrik are part of the Brickworks Group

The product images in our brochures give a general indication of colour for your preliminary selection.
We also recommend you view current product samples before making your final decision.

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