BRICKWORKS

Tru-Brix System from Austral Bricks

Environmental Product Declaration
In accordance with ISO 14025 and EN 15804+A2:2019/AC:2021

Programme: The International EPD® System www.environdec.com
Programme operator: EPD International AB
Regional Programme: EPD Australasia www.epd-australasia.com
EPD Registration No. EPD-IES-0024425:001
Date of publication (Issue): 2025-06-18 **Date of validity:** 2030-06-18
Version Number: 1.0
Geographical Scope of EPD: Australia

EPD of multiple products, based on the average results of the product group. The products covered in the EPD are listed on page 8. 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

EPD® THE INTERNATIONAL EPD® SYSTEM
AUSTRALASIA EPD® INTERNATIONAL EPD SYSTEM
ECO PLATFORM EPD VERIFIED

Table of Contents

Program Information and Verification	4
About Us	6
Our Products	8
Content Declaration	10
Technical Compliance	14
Product Life Cycle	15
Life Cycle Inventory	20
Environmental Performance	28
Results	24
References	32

Program Information and Verification

An Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules). The EPD owner has the sole ownership, liability, and responsibility for the EPD.

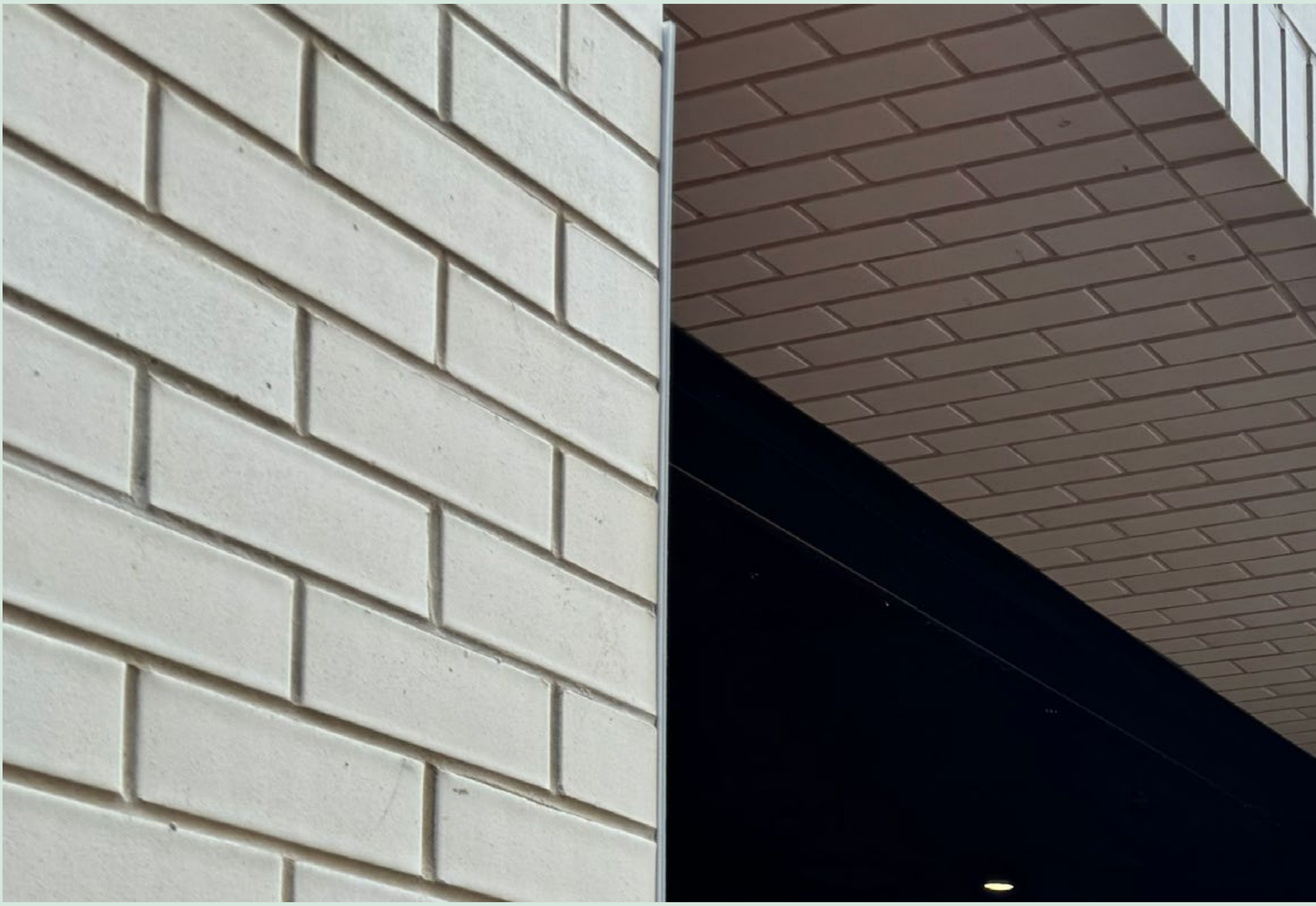
EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

The results for EN15804+A2 compliant EPDs are not comparable with EN15804+A1 compliant studies as the methodologies are different.

Declaration Owner	Address: 738-780 Wallgrove Road, Horsley Park, NSW, 2175 Web: www.brickworks.com.au Phone: 13 27 43 Email: info@brickworks.com.au	BRICKWORKS australbricks
EPD Program Operator and Regional Program	EPD International AB Box 210 60, SE-100 31 Stockholm, Sweden, E-mail: info@environdec.com EPD Australasia Limited Address: 315a Hardy Street Nelson 7010, New Zealand Web: www.epd-australasia.com Email: info@epd-australasia.com Phone: +61 2 8005 8206 (AU)	EPD® THE INTERNATIONAL EPD® SYSTEM AUSTRALASIA EPD® INTERNATIONAL EPD SYSTEM
Life Cycle Assessment (LCA) LCA Accountability:	thinkstep Pty Ltd Barbara Nebel Jeff Vickers Martina Steiner Web: www.thinkstep-anz.com Email: info@thinkstep-anz.com Post: 25 Jubilee Street, Perth, Western Australia 6151, Australia	thinkstep anz
EPD Registration Number:	EPD-IES-0024425:001	**Version**: 1 **Version Date:** 2025-06-18
Published:	2025-06-18	**Valid Until:** 2030-06-18 (5 years)
Reference year for data	2023-07-01 - 2024-06-30	

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

PCR	PCR 2019.14 Construction Products, version 1.3.4 (published on 2024-04-30, valid until 2025-06-20)
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com for a list of members. Most recent review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Independent verification of the declaration and data, according to ISO 14025:	■ EPD verification by individual verifier
Third party verifier: Approved by EPD Australasia Ltd	Sazal Kundu, Edge Impact Address: Greenhouse, Level 3, 180 George Street Sydney NSW 2000, Australia Web: https://www.edgeimpact.global/ Phone: +61 2 9438 0100 Email: sazal.kundu@edgeimpact.global
Procedure for follow-up of data during EPD validity involves third party verifier	☐ Yes ■ No



About Us

Brickworks is one of Australia's largest and most diverse building material manufacturers.

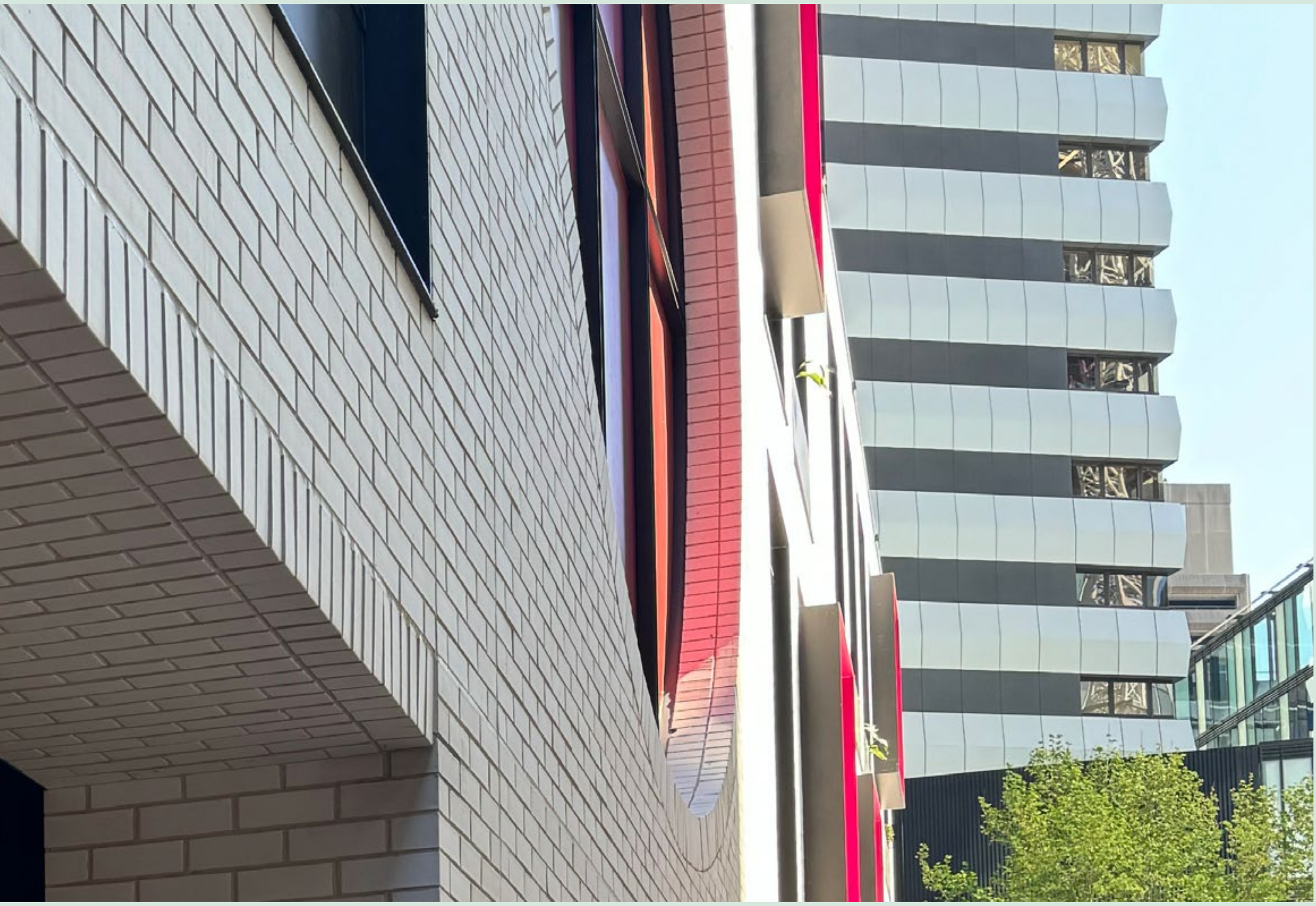
Brickworks has been transformed from an originally NSW state-based operation to an international organisation with manufacturing operations in New South Wales, Victoria, Tasmania, South Australia and Queensland.

Austral Bricks is the subsidiary of Brickworks that manufactures and sells Australian made and imported clay bricks and pavers. Austral Bricks holds multiple ABN's in each state, and multiple brands including Daniel Robertson, Bowral Bricks and Nubrik.

Clay brick products are mainly used in residential and commercial construction. By adding oxides and coloured sands to the mix of raw materials, products with contemporary colours, textures and appeal can be produced. Brickworks manufactures brick products in seven brick plants, located in New South Wales (3), Queensland (1), Tasmania (1), South Australia (1) and Victoria (1) (see Figure 1). Brickworks also import bricks from San Selmo, Italy, and La Paloma, Spain. All bricks are processed into Tru-Brix brick facings by Austral Bricks' high-speed cutting line located at Horsley Park, New South Wales.

This EPD covers all Tru-Brix brick facing products produced across Australia and internationally. The EPD also covers the ZAM-coated steel rail required as part of the system.

Owner of the EPD: Brickworks Limited
Contact: info@brickworks.com.au



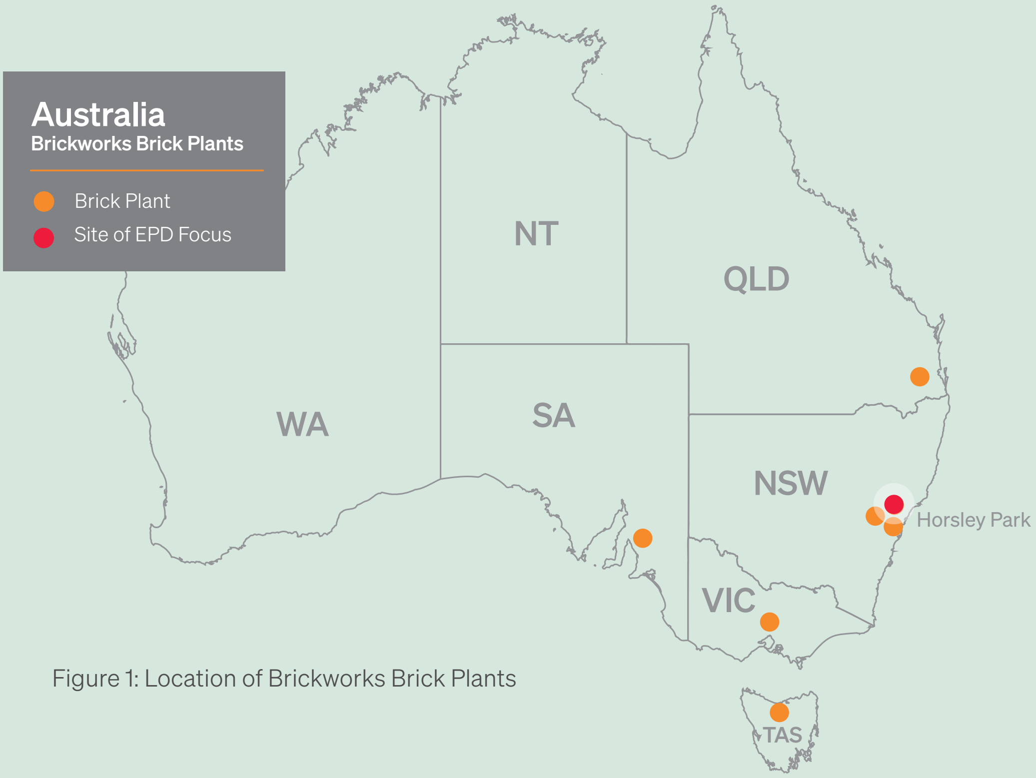


Figure 1: Location of Brickworks Brick Plants

Our Products

The life cycle of brick facings starts with mining clay and shale and mechanically processing it prior to shaping and firing the bricks in kilns fuelled predominantly by natural gas. Finished bricks are tested in Austral Bricks' NATA accredited laboratory to AS/NZS 4456. These bricks, referred to as "full bricks", will be referred to as such in this EPD.

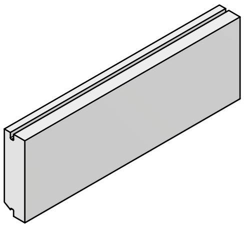
Clay brick facings are processed via cutting and profiling full bricks. They are used in construction, typically in façade walling systems, where they are installed into ZAM-coated steel rails and then mortared into place, creating a ventilated façade system.

This EPD covers all Tru-Brix brick facing products processed at Austral Bricks' high-speed cutting line which the feedstock is sourced across Australia and internationally. The EPD also covers the ZAM-coated steel rail required as part of the system.

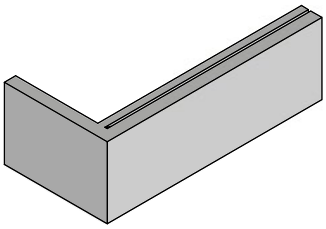
This is an EPD of multiple products is based on the average results of the product group. Grouping is done based on a sale weighted average of all bricks available for use within the Tru-Brix system.

At the time of conducting this LCA, Tru-Brix systems were manufactured at our Punchbowl site. Prior to publication, production shifted to our Horsley Park facility. The significance of this change is likely to be small, but we will review it once we have a full 12 months of data at Horsley Park.

Figure 2 - Typical brick product shape and dimensions for Tru-Brix facing (Source: Brickworks)



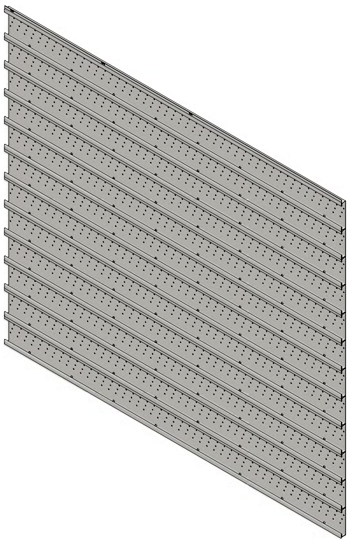
230L x 22W x 76H mm Facings Bricks



230L x 22W x 76H mm Facing Corner Bricks

Facings are available across all 230L x 76H product ranges sold by Austral Bricks, including Bowral Bricks, Daniel Robertson, Nubrik, San Selmo and La Paloma.

Figure 3 –ZAM steel component for the Tru-Brix system (Source: Brickworks)



2400L x 86H mm Tru-Brix Rails stacked vertically

Declared
Unit

The declared unit for this LCA is the material and packaging required for 1 m^2 of a wall. This converts to 54.6 kg for Tru-Brix.

Table 1: Industry Classification

Product	Classification	Code	Category
Thin Tech Plus and Tru-Brix Systems	UN CPC	37350	Non-refractory ceramic building bricks, flooring blocks, support or filler tiles, roofing tiles, chimney-pots, cowls, chimney liners, architectural ornaments and other ceramic construction goods
	ANZSIC	2021	Clay Brick Manufacturing

Content Declaration

Bricks facings may have unique characteristics such as shape, colour and dimensions, but in essence all brick products are made from clay. Minor additives are used to influence appearance (e.g. colour, glazing). The ZAM-coated steel rails are manufactured from G350 steel.

Table 2: Content declaration for one square meter (1 m²) of product

Product components	Weight, kg	Post-consumer recycled material, weight-% of product	Biogenic material, weight-% of product	Biogenic material, kg C/product or declared unit
BRICK	34.7	0	0	0
ZINC-ALUMINIUM-MAGNESIUM ALLOY COATED STEEL	8.90	0	0	0
GALVANISED STEEL	3.54	0	0	0
MORTAR	6.44	0	0	0
SUM	**54.6**	**0**	**0**	**0**

Our products may contain recycled content, however, in line with reporting requirements outlined in the PCR, the above table indicates 0% post-consumer recycled material where we cannot guarantee whether the origin of recycled material is pre-consumer or post-consumer.

Packaging materials

Table 3: Content declaration of Packaging for one [declared unit] of product

Packaging materials	Weight, kg	Weight-% (versus the product)	Biogenic material, kg C/product or declared unit
CARDBOARD	0.0785	0.00151	0.0355
TIMBER	0.0387	0.000742	0.0151
PLASTIC	0.00564	0.000108	0
SUM	**0.123**	**0.00236**	**0.0506**

Dangerous substances from the candidate list of SVHC for Authorisation

No products declared within this EPD contain substances exceeding the limits for registration according to the European Chemicals Agency's "Candidate List of Substances of Very High Concern for authorisation".

Technical Compliance

Brickworks brick products are manufactured to Australian Standard AS/NZS 4455 and AS 3700. Brick product quality testing is performed in accordance with AS/NZS 4456.

The Tru-Brix system has been tested and checked to ensure that it complies with relevant Australian Standards and National Construction Code clauses. It has been tested to AS 4040.2 for serviceability and ultimate limit states, AS 4040.3 for cyclonic wind loads, AS 1530.4-2014 for fire resistance, and NCC 2022 Vol 1 F3V1 and Vol 2 H2V1 for weatherproofing. The system has also been checked for compliance with AS 1170.4 for earthquake loads by professional engineers. Further testing has been done to assess the systems' facing pull-out strength, soft and hard body impact assessment and corbel load resistance. Further details on product use and design for different applications can be found on Brickworks' website and more specifically our product page[1].

Brick products are classified under:

- UN CPC 37350 - Non-refractory ceramic building bricks, flooring blocks, support or filler tiles, roofing tiles, chimney-pots, cowls, chimney liners, architectural ornaments and other ceramic construction goods
- ANZSIC 2021 - Clay Brick Manufacturing

[1] https://www.australbricks.com.au/Tru-Brix

Product
Life Cycle
Overview

As shown in the table below, this EPD has a scope of 'cradle-to-gate with options (modules A4 and A5), modules C1–C4, and module D'. The production stage (Modules A1-A3) includes all aspects of Tru-Brix production from cradle to gate, utilising elementary and product flows.

Table 4: Modules included in the scope of the EPD

Stages	Product stage			Construction process stage		Use stage							End-of-life stage				Resource recovery stage
	Raw material supply	Transport of raw materials	Manufacturing	Transport to customer	Construction / Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to waste processing	Waste processing	Disposal	Reuse - Recovery- Recycling- potential
Modules	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	✓	✓	✓	✓	✓	ND	ND	ND	ND	ND	ND	ND	✓	✓	✓	✓	✓
Geography	GLO	GLO	GLO	AU	AU								AU	AU	AU	AU	AU
Share of specific data		34.5%															
Variation products		45%															
Variation sites		0%															

✓ = included in the EPD; ND = Module not declared (such a declaration shall not be regarded as an indicator result of zero). Specific data includes impacts relate to the manufacturing processes (primarily electricity, diesel and water) and raw material transportation. Variation of products, in percentage, was calculated by dividing the results of the scenario with values furthest away from declared value, by the declared value, for the indicator GWP-GHG for modules A1-A3.

The processes below are included in the product system to be studied. For modules beyond A3, the scenarios included are currently in use and are representative for one of the most probable alternatives.

Product Stages (A1-A3)

Since Module C is included in the EPD, the use of Module A1-A3 results without considering the results of Module C is discouraged.

Raw materials (Module A1)

Austral's bricks are made from natural clay and are kiln fired at high temperatures before being cut into standard or corner facing bricks for use in thin brick systems. For Tru-Brix, Brickworks source bricks from Austral Bricks (a subsidiary of Brickworks) in Australia and La Paloma Cerámicas and Fornace S.Anselmo in Spain and Italy, respectfully. Bricks are received as either full bricks, purposely made into facing sized bricks, or are already pre-cut into facing bricks.

Transport of raw materials (Module A2)

Transport of bricks, steel supports and packaging components from respective suppliers to Brickworks' site, via trucks. Transport of steel used in the product manufacturing is a combination of truck and sea freight.

Manufacture (Module A3)

Brick modelling

The Tru-Brix system can use any bricks manufactured or imported by Brickworks. Brickworks have a range of EPDs covering their bricks and also have EPD data from foreign suppliers. The calculations in this EPD start from these values and then add transportation, facing and groove cutting.

This EPD declares results as a sales weighted average of the brick options available and the variation range accounts for production of all bricks, despite some bricks not being used in the Tru-Brix system within the reference year. The wastage and energy consumption is accounted for in all cases because it is based on the physical parameters of the brick (i.e., transport distances from supplier, number of facings per full brick, etc.).

Brick cutting

Full bricks require an additional round of processing to be cut down into facing sized bricks, producing 1-2 facing bricks per full brick. This facing cut is done on a Peterson saw, which is a wet cutting process. The inputs required are tap water, electricity and diesel for machinery operation. Off-cut scrap brick created during this process is reused by being used in brick feedstock at Brickworks' Austral brick manufacturing facilities which offsets sand raw material.

All facing bricks then undergo groove cutting on a profiler, using electricity and diesel for machinery operation. Thin brick profiling produces waste when facing bricks are rejected due to poor quality and via dust from the cutting process. Both waste types are reused in brick manufacturing on-site.

Steel modelling

The Tru-Brix system uses a steel rail system manufactured using the primary steelmaking route (blast furnace and basic oxygen furnace) and coated with an Aluminium-Zinc-Magnesium (AZM) alloy. Brickworks' supplier does not have an EPD and, as such, an EPD for the same technology type from an alternative manufacturer was used as a proxy (International EPD System registration number IES-008456:001).

Construction Stage (Modules A4, A5)

Distribution includes transport of the product to customers in Australia. The weighted average distance from manufacturing in Punchbowl, NSW, to various destinations across Australia was calculated based on a sale weighted average. This is an average scenario that may not be representative for any given customer. Customers should individually establish the transport requirements between distribution centre and their site rather than relying on the average.

Table 5: Transport to building site

Scenario information	Unit (per declared unit)
Vehicle type used for transport e.g. long distance truck, boat etc.	Truck: transport, freight, lorry 16-32 metric ton, EURO4 Ship: transport, freight, sea, container ship
Distance	399.2 km via truck (weighted average)
Capacity utilisation (including empty returns)	50% (truck)
Bulk density of transported products	1 343 kg/m³ for Bricks 616 kg/m³ for steel
Volume capacity utilisation factor (factor: =1 or < 1 or ≥ 1 for compressed or nested packaged products)	Not applicable

After being delivered to site, Tru-Brix components (bricks, steel rail, support trim) are unpacked and installed. Brickworks recommend M3 and M4 grade mortar to point into the 10 mm mortar joints, depending on corrosive category.

Table 6: Installation of the product in the building

Scenario information	Unit (per declared unit)
Ancillary materials for installation (specified by material);	6.43 kg mortar 0.237 kg fixings
Water use	0 m³
Other resource use	0 kg
Quantitative description of energy type and consumption during the installation process	0 MJ
Waste materials on the building site before waste processing, generated by the product's installation (specified by type)	1.92 kg brick
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route)	1.92 kg brick recycled
Direct emissions to ambient air, soil and water	N/A

End of Life (Modules C1-C4)

When a building reaches its end-of-life it will be demolished (C1) and the demolition waste transported to a processing facility (C2). The waste processing (C3) includes the separation of steel waste from other building materials and shredding activities. Material that cannot be recycled will be disposed (C4). The end-of-life stage (Modules C1-C4) and resource recovery stage (Module D) are modelled using a scenario reflecting end-of-life recycling/ landfilling rates for steel products in the construction sector (Table 8). This scenario is currently in use and is representative for one of the most likely scenario alternatives.

We assume the Chinese steel has the same recycled content and secondary material content as the steel EPD. This steel has been virtually looped back into module A1-A3, reducing the amount of steel going to recycling at end-of-life.

Recovery and Recycling Potential (Module D)

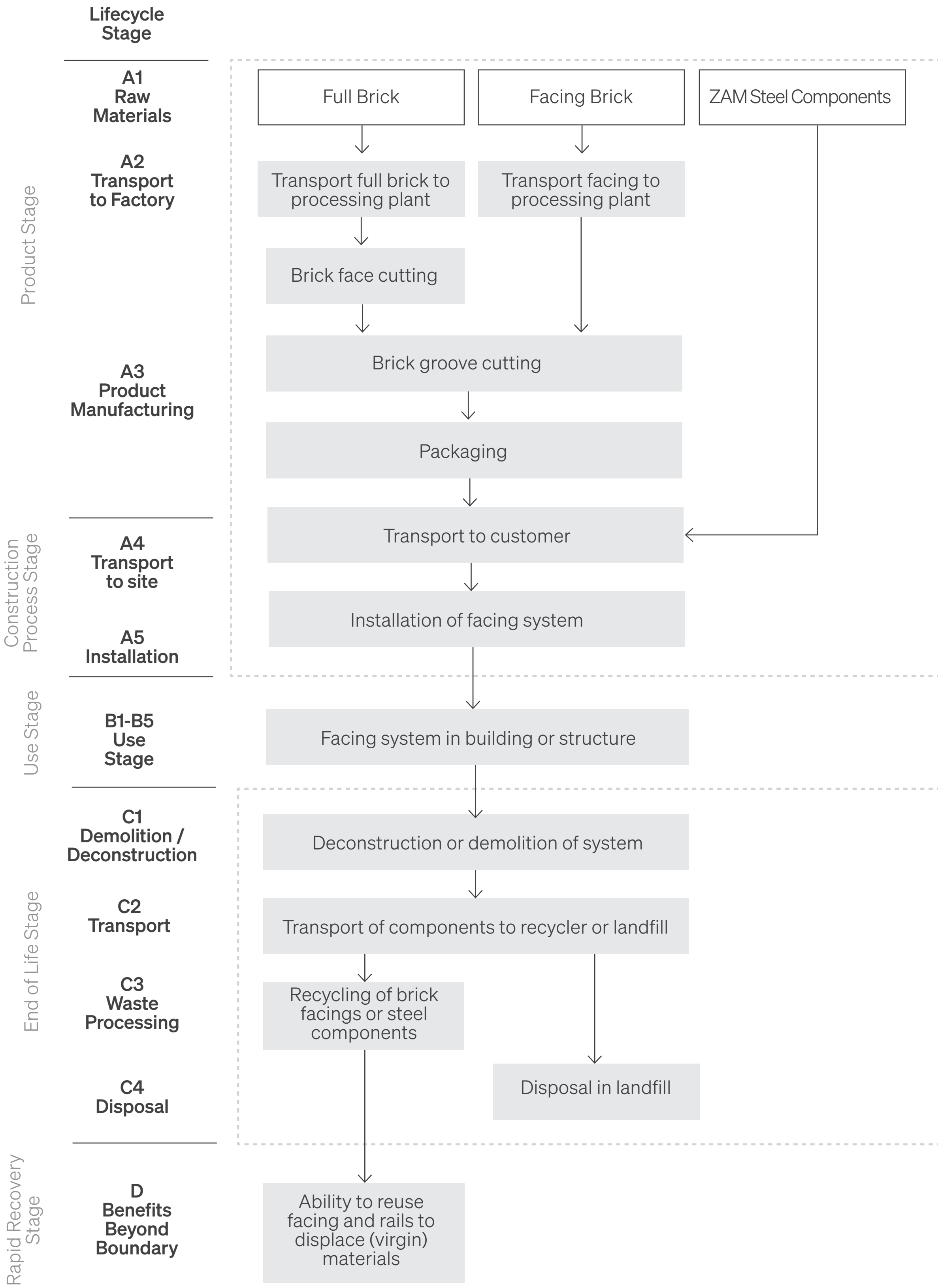
Module D starts at the "end of waste" when the product or packaging are no longer in their first life cycle and start to be a potential input for their second life cycle.

In Module C3, 90% of steel is made available for recycling. The ZAM steel rail for the Tru-Brix system is modelled based on EPD data of a similar product from a different manufacturer as no EPD data was available from the supplier. The steel has 17.4% recycled content from post-consumer scrap and therefore, module D has a benefit assigned from the positive net recycling balance.

Table 7: End of life scenarios for products

Process	Unit (per declared unit of components products or materials and by type of material)	References
Collection process specified by type	Equivalent of 1 m² of Brickworks thin brick system	
Recovery system specified by type	Bricks: 90% recycled, 10% to landfill Steel: 90% recycled, 10% to landfill	(NSW Government, 2024)
	Plastics: 100% to landfill	(Australian Government, 2024)
	Cardboard: 100% recycled	
Disposal specified by type	Bricks: inert waste, inert material landfill Steel: scrap steel, inert material landfill Plastics: Plastic waste on landfill	
Assumptions for scenario development, e.g. transportation	C1 - Demolishing with an Excavator (100 kW)- Fuel consumption is calculated at 0.172 kg diesel input per tonne of material. C2 - 100 km of transport by truck, with a utilisation capacity of 50% C3 – Bricks: Recycled C3 – Steel: Recycled C4 – Bricks: Landfill of inert material C4 – Steel: Landfill of inert material	

Flow Diagram of the Life Cycle of Tru-Brix



Life Cycle Inventory (LCI)

Data and Assumptions

Specific data was used for all manufacturing operations up to the factory gate, including upstream data for production of bricks, based on Brickworks published EPDs. Specific data for Brickworks operations was collected for the 12-month period between 2023-07-01 to 2024-06-30. Water use in relation to Brickworks manufacturing site was characterised using ALCAS water catchments characterisation factors for the AWARE method.

Upstream Data

Australian specific datasets have been used where available, including the NSW residual electricity mix.

EPD data for the ZAM steel was used as a proxy because no data was available from Brickworks' Chinese supplier. As the Chinese grid includes a small portion of nuclear power, this means the RWD indicator may not fully represent Chinese conditions.

LCA Software and Database

The LCA was conducted in Microsoft Excel. The LCA utilises lifecycle inventory data from ecoinvent, Allocation, cut-off, EN15804, ecoinvent database version 3.10 (Wernet, 2016) for several of the raw and process materials obtained from the background system. EPD data was used to model the bricks and ZAM steel production in modules A1-A3, and AusLCI data (ALCAS, 2025) was used for water. Both primary and background data have reference years between 2020-2023 and therefore fall within the EN 15804 and PCR requirements of 10 years for generic data and 5 years for producer specific data.

The ecoinvent datasets have not been adapted as they are provided in Excel and have not been used in conjunction with an LCA software. This includes capital goods and infrastructure as they are included in the background datasets provided by ecoinvent database for Excel and it is not possible to subtract them in Excel.

Electricity

The composition of the residual electricity grid mix of New South Wales is modelled in AusLCI based on published data for the financial year 2022-07-01 – 2023-06-30 (Australian Government, 2024).

The New South Wales residual electricity mix is made up of Black coal 65.6%, Solar 11.1%, Wind 5.03%, Hydro 4.74%, Natural gas 2.01%, Biomass 0.633%, Biogas 0.379%, Oil Products 0.114%, and Coal seam methane 0.00228%. The remaining electricity is imported: 5.29% is imported from Victoria, and 5.16% is imported from Queensland.

The emission factor for the New South Wales residual grid mix for the GWP-GHG indicator is 0.855 kg CO2e/kWh (based on EF 3.1).

Explanation of Average Products & Variation

This is an EPD of multiple products is based on the average results of the product group. Grouping is done based on a sale weighted average of all bricks available for use within the Tru-Brix system.

The variation of GWP-GHG is 45% for modules A1-A3, so the variation range across all indicators for modules A-C is declared in the core and additional environmental results.

Cut Off Criteria

Personnel-related processes are excluded as per section 4.3.2 in the PCR (EPD International, 2023).

thinkstep-anz consistently excludes environmental impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the foreground production process, ('capital goods') regardless of potential significance. High-quality infrastructure-related data isn't always available and there is no clear cut-off for what to include. For this reason, capital goods data are applied to LCA studies inconsistently. This is expected to lead to reduced consistency and comparability of EPDs. Capital goods were previously excluded from EPDs, thus including capital goods in current EPDs would further reduce their comparability.

In this study capital goods and infrastructure have been included in the background datasets as provided by ecoinvent (Wernet). It is not possible, within reasonable effort, to subtract the data on infrastructure/capital goods from these datasets

All other reported data were incorporated and modelled using the best available life cycle inventory data.

Allocation

Where subdivision of processes was not possible, allocation rules listed in PCR chapter 6.7 have been applied. Multi-output allocation generally follows the requirements of ISO 14044, section 4.3.4.2. Site level data for electricity, diesel for mobile plant (e.g. loaders), water, and lubricant usage are allocated by mass, based on the annual production. Allocation of background data (energy and materials) taken from the ecoinvent databases is documented online at https://ecoquery.ecoinvent.org/3.10/EN15804/search.

Assumptions

- Cut-off criteria, as per the PCR 2012:01+A2 (CEN, 2019) are reasonable in the context of the overall impacts of the thin brick system.
- Accuracy of data measurement falls within normal industrial weighing systems accuracy limits of ±5%.
- Where specific life cycle inventory data were unavailable, proxy data were used, giving preference to regional data, documented in Chapter 3.
- Tru-brix can be used with multiple Austral and imported bricks, to simplify the presentation of results, a weighted average of the impact of all bricks was calculated, based on annual sales data.
- For all transportation via truck, a 16-32 metric ton EURO4 truck dataset was used. This could be more conservative than trucks used to ship heavy materials across large distances in Australia.
- It was assumed that secondary data from outside Australia is sufficiently representative of the impacts of the raw material inputs. Where the geography is expected to have an impact on the results, this is indicated as a geographical proxy.
- All products have the same distribution profile – i.e. sales weighted distribution is used across product range.
- Benefits in Module D are modelled based on recycling assumptions in the steel EPD. As steel is used in Australia, it's end-of life assumptions and subsequent Module D calculations reflect the regional specifics for steel recycling including typical transport distances.

Assessment Indicators

The results tables describe the different environmental indicators for each product per declared unit, for each declared module. The EN 15804+A2 reference package based on EF 3.1 is used.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Table 8: Core environmental impact indicators (based on EF 3.1)

Indicator	Description	Abbrev.	Unit	Reference
Climate change - total	A measure of greenhouse gas emissions, such as CO2 and methane. These emissions are causing an increase in the absorption of radiation emitted by the earth, increasing the natural greenhouse effect. This may in turn have adverse impacts on ecosystem health, human health and material welfare	GWP-total	kg CO_2-eq.	(IPCC, 2021)
Climate change - fossil		GWP-fossil	kg CO_2-eq.	(IPCC, 2021)
Climate change - biogenic		GWP-biogenic	kg CO_2-eq.	(IPCC, 2021)
Climate change - land use and land use change		GWP-luluc	kg CO_2-eq.	(IPCC, 2021)
Ozone Depletion	A measure of air emissions that contribute to the depletion of the stratospheric ozone layer. Depletion of the ozone leads to higher levels of UVB ultraviolet rays reaching the earth's surface with detrimental effects on humans and plants	ODP	kg CFC11-eq.	(WMO, 2014)
Acidification	A measure of emissions that cause acidifying effects to the environment. The acidification potential is a measure of a molecule's capacity to increase the hydrogen ion (H+) concentration in the presence of water, thus decreasing the pH value. Potential effects include fish mortality, forest decline and the deterioration of building materials.	AP	Mole of H+ eq.	(Seppälä, 2016; Posch, 2008)

Indicator	Description	Abbrev.	Unit	Reference
Eutrophication aquatic freshwater	Eutrophication covers all potential impacts of excessively high levels of macronutrients, the most important of which nitrogen (N) and phosphorus (P). Nutrient enrichment may cause an undesirable shift in species composition and elevated biomass production in both aquatic and terrestrial ecosystems. In aquatic ecosystems increased biomass production may lead to depressed oxygen levels, because of the additional consumption of oxygen in biomass decomposition.	EP-fw	kg P eq.	(Struijs, 2009)
Eutrophication aquatic marine		EP-fm	kg N eq.	(Struijs, 2009)
Eutrophication terrestrial		EP-tr	Mole of N eq.	(Seppälä, 2016; Posch, 2008)
Photochemical ozone formation	A measure of emissions of precursors that contribute to ground level smog formation (mainly ozone O3), produced by the reaction of VOC and carbon monoxide in the presence of nitrogen oxides under the influence of UV light. Ground level ozone may be injurious to human health and ecosystems and may also damage crops.	POCP	kg NMVOC eq.	(van Zelm, 2008)
Depletion of abiotic resources - minerals and metals[1,2]	The consumption of non-renewable resources leads to a decrease in the future availability of the functions supplied by these resources. Depletion of mineral resources is assessed based on ultimate reserves.	ADP-mm	kg Sb-eq.	(van Oers, de Koning, Guinée, & Huppes, 2002; Guinée, et al., 2002)
Depletion of abiotic resources - fossil fuels[1]	The consumption of non-renewable resources leads to a decrease in the future availability of the functions supplied by these resources.	ADP-fossil	MJ	(van Oers, de Koning, Guinée, & Huppes, 2002)
Water use[1]	A measure of the net intake and release of fresh water across the life of the product system.	WDP	m^3 world equiv.	(Boulay, Bare, Benini, & et al, 2018)

[1] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

[2] The results of the impact categories abiotic depletion of minerals and metals, land use, human toxicity (cancer), human toxicity, noncancer and ecotoxicity (freshwater) may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes.

Table 9: Resource use indicators

The use of primary energy is separated into energy used as raw material and energy used as energy carrier as per option C in Annex 3 in the PCR (EPD International, 2024).

Indicator	Abbrev.	Unit
Renewable primary energy as energy carrier	PERE	MJ, net calorific value
Renewable primary energy resources as material utilization	PERM	MJ, net calorific value
Total use of renewable primary energy resources	PERT	MJ, net calorific value
Non-renewable primary energy as energy carrier	PENRE	MJ, net calorific value
Non-renewable primary energy as material utilization	PENRM	MJ, net calorific value
Total use of non-renewable primary energy resources	PENRT	MJ, net calorific value
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ, net calorific value
Use of non-renewable secondary fuels	NRSF	MJ, net calorific value
Use of net fresh water	FW	m^3
Use of net fresh water	FW	m^3

Table 10: Waste material and output flow indicators

Indicator	Abbrev.	Unit
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg
Components for re-use	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported electrical energy	EEE	MJ
Exported thermal energy	EET	MJ

Table 11: Additional environmental impact indicators

Impact Indicator	Description		Unit	Reference
GWP-GHG[1]	Total global warming potential, excluding biogenic carbon and including land use and change, over a 100-year period	GWP-GHG	kg CO_2-eq.	(IPCC, 2021)
GWP-GHG (IPCC AR5)[2]	Total global warming potential, excluding biogenic carbon and including land use and change, over a 100-year period, excluding climate change feedback	GWP-GHG (IPCC AR5)	kg CO_2-eq.	(IPCC, 2013)
Respiratory inorganics	Damage to human health from outdoor and indoor emissions of primary and secondary PM2.5 in urban and rural areas	PM	Disease incidences	(Fantke, et al., 2016)
Ionizing radiation - human health[3]	Impact of low dose ionizing radiation on human health of the nuclear fuel cycle and ionizing radiation from the soil, radon, and some construction materials.	GWP-luluc	kg CO_2-eq.	(IPCC, 2021)
Eco-toxicity – freshwater[5]	Toxic effect on aquatic freshwater species in the water column	ETP-fw	Comparative toxic units (CTU_h)	(Rosenbaum, et al., 2008)
Human toxicity, cancer[4],[5]	A measure of the impact of chemical emissions on human health	HTPc	Comparative toxic units (CTU_h)	(Rosenbaum, et al., 2008)
Human toxicity, non-cancer[4],[5]	A measure of the impact of chemical emissions on human health	HTPnc	Comparative toxic units (CTUh)	(Rosenbaum, et al., 2008)
Land use related impacts / soil quality[4],[5]	This index is the result of the aggregation, performed by JRC, of the 4 indicators provided by LANCA model for assessing impacts due to land use	SQP	Dimensionless, aggregated index of: kg biotic production / (m2 *a) kg soil / (m2 *a)	(Bos, Horn, Beck, Lindner, & Fischer, 2016)

[1] This indicator is identical to GWP-total except that the CF for biogenic CO2 is set to zero. It has been included in the EPD following the PCR (EPD International, 2024).

[1] This indicator should be identical to GWP-total except that the CF for biogenic CO2 is set to zero. It has been included in the EPD following the PCR (EPD International, 2024). In this study it is calculated by subtracting the value of Climate change – biogenic (GWP-biogenic) from the value of Climate change – total (GWP-total) since the ecoinvent Excel LCIA results do not include the indicator.

[2] GWP-GHG (IPCC AR5) is an additional GWP100 indicator that is aligned with the Intergovernmental Panel on Climate Change (IPCC) 2013 Fifth Assessment Report (AR5) (IPCC 2013), national greenhouse gas reporting frameworks in Australia and New Zealand and previous versions of the Construction Products PCR (PCR2019:14v1.11). It excludes biogenic carbon and indirect radiative forcing.

[3] This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

[4] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator

[5] The results of the impact categories abiotic depletion of minerals and metals, land use, human toxicity (cancer), human toxicity, noncancer and ecotoxicity (freshwater) may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes.

It shall be noted that the above impact categories represent impact potentials, i.e., they are approximations of environmental impacts that could occur if the emissions would (a) actually follow the underlying impact pathway and (b) meet certain conditions in the receiving environment while doing so. In addition, the inventory only captures that fraction of the total environmental load that corresponds to the functional unit (relative approach). LCIA results are therefore relative expressions only and do not predict actual impacts, the exceeding of thresholds, safety margins, or risks.

Table 12: Biogenic carbon content indicators

Indicator	Abbrev.	Unit
Biogenic carbon content - product	BCC-prod	kg
Biogenic carbon content - packaging	BCC-pack	kg

For Tru-Brix, the following indicators are not relevant, hence result in zero values:

- Components for re-use (CRU) is zero since there are none produced.

Environmental Performance

The following tables show the results one square meter (1 m²) of wall.

Table 13: Core environmental impact indicators for 1 m² of Tru-Brix

Environmental impact	Abbv.	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	A-C variation within group
Global warming potential – total	GWP-total	kg CO_2-eq.	5.58E+01	3.94E+00	1.25E+01	4.19E-02	1.01E+00	8.09E-01	2.84E-02	-1.92E+01	34%
Climate change - |fossil	GWP-fossil	kg CO_2-eq.	5.63E+01	3.94E+00	1.23E+01	4.19E-02	1.01E+00	8.09E-01	2.84E-02	-1.93E+01	33%
CLIMATE CHANGE - BIOGENIC	GWP-biogenic	kg CO_2-eq.	-3.61E-01	1.38E-05	1.90E-01	4.18E-06	3.52E-06	2.92E-01	3.24E-02	3.09E-02	166%*
Climate change - land use and land use change	GWP-luluc	kg CO_2-eq.	1.17E-02	1.59E-03	9.62E-04	3.64E-06	4.05E-04	7.03E-05	1.48E-05	-9.39E-03	83%
Ozone Depletion	ODP	kg CFC11-eq.	3.89E-07	5.87E-08	6.79E-09	6.40E-10	1.50E-08	1.24E-08	8.21E-10	-2.31E-09	74%
Acidification	AP	Mole of H+ eq.	2.75E-01	1.65E-02	4.45E-02	3.78E-04	4.20E-03	7.30E-03	2.01E-04	-4.44E-02	237%
Eutrophication aquatic freshwater	EP-freshwater	kg P eq.	1.75E-03	3.10E-04	2.43E-04	1.22E-06	7.90E-05	2.36E-05	2.36E-06	-1.03E-05	65%
Eutrophication aquatic marine	EP-marine	kg N eq.	7.60E-02	6.00E-03	1.00E-02	1.75E-04	1.53E-03	3.39E-03	7.67E-05	-1.09E-02	208%
Eutrophication terrestrial	EP-terrestrial	Mole of N eq.	8.38E-01	6.54E-02	1.12E-01	1.92E-03	1.67E-02	3.71E-02	8.37E-04	-1.18E-01	210%
Photochemical ozone formation	POCP	kg NMVOC eq.	2.56E-01	2.28E-02	3.29E-02	5.72E-04	5.81E-03	1.11E-02	3.00E-04	-3.62E-02	182%
Depletion of abiotic resources - minerals and metals	ADP-minerals&metals	kg Sb-eq.	1.34E-04	1.30E-05	3.13E-05	1.50E-08	3.32E-06	2.90E-07	4.51E-08	-5.97E-07	36%
Depletion of abiotic resources - fossil fuels	ADP-fossil	MJ	6.74E+02	5.57E+01	1.15E+02	5.47E-01	1.42E+01	1.06E+01	6.96E-01	-1.47E+02	40%
Water use	WDP	m³ world equiv.	3.83E+00	2.50E-01	7.72E-01	1.34E-03	6.38E-02	2.59E-02	1.95E-03	-1.74E-01	29%

* Although A-C variation is high for GWP-biogenic, this indicator contributes less than 1% of GWP-total

Table 14: Resource use indicators for 1 m² of Tru-Brix

Resource use	Abb.	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	3.09E+01	7.31E-01	7.77E+00	3.35E-03	1.86E-01	8.54E-03	6.46E-03	2.53E+01
Renewable primary energy resources as material utilization	PERM	MJ	1.88E+00	0.00E+00	-1.82E+00	0.00E+00	0.00E+00	-1.21E-02	0.00E+00	0.00E+00
Total use of renewable primary energy resources	PERT	MJ	3.28E+01	7.31E-01	5.95E+00	3.35E-03	1.86E-01	-1.55E-01	6.46E-03	2.53E+01
Non-renewable primary energy as energy carrier	PENRE	MJ	6.73E+02	5.57E+01	1.15E+02	5.47E-01	1.42E+01	1.06E+01	6.97E-01	-1.47E+02
Non-renewable primary energy as material utilization	PENRM	MJ	3.46E-01	0.00E+00	-1.27E-01	0.00E+00	0.00E+00	5.19E-02	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	PENRT	MJ	6.73E+02	5.57E+01	1.15E+02	5.47E-01	1.42E+01	1.02E+01	6.97E-01	-1.47E+02
Use of secondary material	SM	kg	1.84E+00	2.50E-02	5.63E-01	2.27E-04	6.37E-03	4.39E-03	1.75E-04	-8.49E-04
Use of renewable secondary fuels	RSF	MJ	9.72E-03	3.19E-04	5.49E-03	5.94E-07	8.12E-05	1.15E-05	3.62E-06	-9.50E-06
Use of non-renewable secondary fuels	NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	FW	m³	3.06E-01	7.36E-03	2.58E-02	3.56E-05	1.88E-03	6.87E-04	7.22E-04	-1.32E-02

Table 15: Waste material and output flow indicators for 1 m² of Tru-Brix

Waste categories and output flows	Abb.	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	HWD	kg	5.26E-01	9.71E-02	5.44E-02	6.12E-04	2.48E-02	1.18E-02	7.74E-04	-2.65E-03
Non-hazardous waste disposed	NHWD	kg	1.03E+01	1.82E+00	1.41E+00	8.36E-03	4.65E-01	1.62E-01	4.541867288	-3.42E-01
Radioactive waste disposed	RWD	kg	1.46E-03	3.33E-06	5.58E-04	1.72E-08	8.49E-07	3.33E-07	3.12E-08	2.30E-03
Components for re-use	CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	MFR	kg	5.62E+01	4.10E-04	3.28E+00	1.48E-06	1.05E-04	40.87680559	3.03E-06	-1.53E-05
Materials for energy recovery	MER	kg	1.97E-05	3.60E-06	7.94E-06	7.50E-09	9.17E-07	1.45E-07	1.36E-08	-8.44E-08
Exported electrical energy	EEE	MJ	2.16E-02	4.05E-03	2.96E-03	2.48E-05	1.03E-03	4.79E-04	4.25E-05	-3.14E-04
Exported thermal energy	EET	MJ	4.10E-02	8.18E-03	1.39E-02	1.30E-05	2.09E-03	2.52E-04	2.72E-05	-9.35E-04

Table 16: Additional environmental impact indicators for 1 m² of Tru-Brix

Additional Indicators	Abb.	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	A-C variation within group
GWP-GHG	GWP-GHG	kg CO_2-eq.	5.56E+01	3.95E+00	1.24E+01	4.19E-02	1.01E+00	8.09E-01	2.84E-02	-1.95E+01	39%
IPCC AR5 GWP-GHG	GWP-GHG (IPCC AR5)	kg CO_2-eq.	5.62E+01	3.94E+00	1.33E+01	4.19E-02	1.01E+00	5.47E-01	2.52E-02	-1.91E+01	33%
Respiratory inorganics	PM	Disease incidences	3.15E-06	3.22E-07	5.49E-07	1.07E-08	8.21E-08	4.28E-07	4.58E-09	-6.54E-07	64%
Ionizing radiation - human health	IRP	kBq U235 eq.	5.03E-01	4.57E-02	1.34E-01	2.45E-04	1.16E-02	4.74E-03	4.44E-04	2.54E-01	74%
Eco-toxicity – freshwater	ETP-fw	CTUe	1.29E+02	1.48E+01	1.99E+01	7.76E-02	3.77E+00	1.50E+00	9.52E-02	-2.25E+01	24%
Human toxicity, cancer	HTPc	CTUh	1.14E-07	2.06E-08	3.45E-09	1.64E-10	5.24E-09	3.16E-09	1.28E-10	-3.08E-08	120%
Human toxicity, non-canc.	HTPnc	CTUh	7.10E-07	3.57E-08	2.08E-07	7.43E-11	9.09E-09	1.44E-09	1.25E-10	2.49E-08	34%
Land use related impacts / soil quality	SQP	Pt	2.53E+02	3.32E+01	1.71E+01	3.83E-02	8.47E+00	7.41E-01	1.37E+00	1.20E+01	33%

Table 17: Biogenic carbon content indicators for 1 m² of of Tru-Brix

Biogenic carbon content	Abb.	Unit	A1-A3
Biogenic carbon content - product	BCC-prod	kg	0
Biogenic carbon content - packaging	BCC-pack	kg	4.01E-02

References

CEN. (2021). EN 15804:2012+A2:2019/AC:2021 Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products. Brussels: European Committee for Standardization.

ECHA. (2024). Candidate List of substances of very high concern for Authorisation. Retrieved from European Chemical Agency: www.echa.europa.eu/candidate-list-table

EPD International. (2018). PCR 2012:01 Construction products and construction services, version 2.3. Stockholm: EPD International AB.

EPD International. (2024a). PCR 2019:14 Construction Products version 1.3.4 of 2024-04-30 (valid until 2025-06-20). Stockholm: EPD International AB.

EPD International. (2021). General Programme Instructions for the International EPD(r) System. Version 4.0, dated 2021-03-29. Stockholm: EPD International AB.

IPCC. (2013). Climate Change 2013: The Physical Science Basis. Geneva: IPCC.

IPCC. (2021). Climate Change 2021: The Physical Science Basis. Geneva: IPCC.

ISO. (2006a). ISO 14040: Environmental management – Life cycle assessment – Principles and framework. Geneva: International Organization for Standardization.

ISO. (2006b). ISO 14044: Environmental management – Life cycle assessment – Requirements and guidelines. Geneva: International Organization for Standardization.

ISO. (2006c). ISO 14025: Environmental labels and declarations - Type III environmental declarations - Principles and procedures. Geneva: International Organization for Standardization.

Wernet, G. B.-R. (2016). The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, 21(9)([online]), 1218–1230.

EPD Australasia. (2024). Instructions of the Australasian EPD Programme v4.2 (published on 2024-04-12).

Brickworks. (2025). Brickworks Clay Bricks and Pavers made in Australia (EPD-IES-0010930:002 - 0010936:002 Valid until: 2029-11-26 version 2.0). Nelson, New Zealand: EPD Australasia Limited.

Etex Australia. (2024). Siniat metal framing products manufactured using ZINCALUME® AM 150 in Beenleigh, Queensland, Australia (S-P-07444 Published on: 2024-02-01 Valid until: 2029-02-01 version 1.0). Nelson, New Zealand: EPD Australasia Limited.


BRICKWORKS

Backed by Brickworks

–

Local expertise. Global quality. Brickworks Building Products are one of Australia's biggest building material producers. With heritage going all the way back to one of Australia's founding brick producers, we're proud of our reputation for design, innovation and sustainability.

BRICKWORKS

AUSTRALIA

australbricks
australmasonry
bristileroofing
southern cross cement
BOWRAL BRICKS
DANIEL ROBERTSON
NUBRIK
GB Masonry
URBANSTONE
CAPITAL BATTENS

NORTH AMERICA

Glen-Gery
BRICKWORKS SUPPLY CENTER

INTERNATIONAL BRANDS

La Escandella ROOFING THE WORLD
S.ANSELMO vivere la differenza
la paloma cerámicas

Backed by Brickworks

Brickworks is proud to be Australia's leading building products manufacturer.

Resources

Download our Sustainability report

Contact Us

Visit.
brickworks.com.au

Call.
13 Brick

Design Studios

Sydney
Tel. 02 9611 4200
2 Barrack Street
Sydney NSW 2000

Melbourne
Tel. 03 8621 7777
367 Collins Street
Melbourne VIC 3000

Brisbane
Tel. 07 3634 5604
27 James Street
Fortitude Valley QLD 4006

Adelaide
Tel. 08 8443 2222
70 Hindmarsh Square
Adelaide SA 5000

Hobart
Tel. 03 6212 9120
7-9 Franklin Wharf
Hobart TAS 7000

Follow Us