Environmental Product Declaration

In accordance with ISO 14025:2006
and EN 15804:2012+A2:2019/AC:2021

BlueScope

ZINC HI-TEN® steel EPD

Substrate Z450 coating at 0.80mm BMT

ECO PLATFORM EPD VERIFIED

EPD® THE INTERNATIONAL EPD® SYSTEM

AUSTRALASIA EPD® ENVIRONMENTAL PRODUCT DECLARATION

Programme: **The International EPD® System | environdec.com**
Programme Operator: **EPD International AB**
Regional Programme: **EPD Australasia | epd-australasia.com**
EPD Registration number: **EPD-IES-0016280:001**
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Version date: **2024-08-30**
Geographical scope: **Australia**

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

Programme-Related Information and Verification

Declaration Owner:	**BlueScope Steel Ltd** steeldirect@bluescopesteel.com www.bluescope.com Level 24, 181 William Street, Melbourne, VIC 3000, Australia
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Accountabilities for PCR, LCA and independent third-party verification	
CEN standard EN 15804 serve as the core Product Category Rules (PCR)	
Product Category Rules (PCR):	PCR 2019:14 Construction Products, Version 1.3.4, 2024-04-03
PCR review conducted by:	The Technical Committee of the International EPD System See www.environdec.com for a list of members Review chair: Claudia A. Peña, University of Concepción, Chile The review panel may be contacted via the Secretariat www.environdec.com/contact
Life Cycle Assessment (LCA) accountability:	Emily Townsend / Vi Kie Soo thinkstep-anz info@thinkstep-anz.com www.thinkstep-anz.com
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	☐ EPD process certification ☑ EPD verification by individual verifier
Third-party verifier:	 **Rob Rouwette, start2see Pty Ltd** Rob.Rouwette@start2see.com.au Approved by: The International EPD System
Verifier approved by:	**EPD Australasia Ltd**
Procedure for follow-up during EPD validity involves third party verifier:	☐ Yes ☑ No
EPD Version History:	v1.0 Initial release.

General Information

- 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.
- BlueScope Steel Limited has sole ownership, liability and responsibility for this EPD.

BlueScope Sustainability Snapshot

Sustainability and Climate Action

Our vision for BlueScope in Australia is to be a vibrant, modern manufacturer, embodying progress, innovation and sustainability.

Steel is central to a circular economy – one where resources and materials are kept in use for as long as possible and then repaired, returned or recycled. Steel can be infinitely recycled and is 100% recyclable without loss of quality, in some cases it can be reused without reprocessing.

We recognise that steelmaking is emissions-intensive and we are committed to climate action. We strive to reduce the embodied carbon of our products, which is supported by our climate strategy and plans.

Building a pathway to low emission-intensity iron and steelmaking in Australia is a key priority for our business. Our global decarbonisation pathway outlines the steps we plan to take to meet our 2030 greenhouse gas emission targets[1] and net zero 2050 goal[2].

For more information on BlueScope's approach to sustainability and climate action visit steel.com.au/sustainability

Credentials and certifications

A number of BlueScope's products, product disclosures, and operations are recognised by third-party programs and credentials. These credentials are recognised in rating tools in Australia including Green Star, IS Rating and the Living Building Challenge.

BlueScope's Port Kembla Steelworks site, where the steel for BlueScope's branded products is manufactured, is certified to the ResponsibleSteel™ Standard v1.1. The ResponsibleSteel™ certification can give organisations in the steel value chain confidence in the environmental, social and governance performance of our steelmaking facilities, and may help them to meet their climate objectives and manage supply chain risks.

In addition to Environmental Product Declarations, a range of BlueScope products are certified to the ecolabel Global GreenTag^CertTM GreenRate™ and have achieved the highest rating, 'Level A'.

For more information about BlueScope's credentials and certifications, including how they can contribute to a project's Green Star rating, visit steel.com.au/sustainability

1. Applies to our Scope 1 and 2 emissions, relative to a 2018 baseline, across our midstream or non-steelmaking activities. The non-steelmaking target applies to our midstream activities that include our cold rolled, metal coating and painting lines and long and hollow products. It excludes our downstream activities.
2. Our net zero goal covers BlueScope's scope 1 and 2 greenhouse gas emissions across our operations. We acknowledge that achieving this goal is highly dependent on several enablers, including the development and diffusion of ironmaking technologies to viable and commercial scale; access to appropriate quality and sufficient quantities of economic raw materials; access to internationally cost-competitive, firmed large-scale renewable energy; availability of competitively priced green hydrogen, with natural gas enabling the transition to green hydrogen; and supportive and consistent policy policies across all of these enablers to underpin decarbonisation.

Declared Unit

This EPD is valid for one flat square metre (1 m²) of ZINC HI-TEN® steel with a substrate metal coating class of Z450 in 0.80mm base metal thickness (BMT) manufactured by BlueScope in Australia.

Product Description

ZINC HI-TEN® steel is a hot-dipped zinc-coated structural steel product specifically designed with guaranteed yield strengths and excellent welding and painting to ensure light gauge structural requirements are met. ZINC HI-TEN® steel is typically used in applications such as purlins, scaffolding, fencing posts and railings.

This EPD sets out information on the average ZINC HI-TEN® steel product[3] manufactured by BlueScope in Australia with a steel substrate and a zinc (Z450) coating to provide corrosion resistance, in the 0.80mm base metal thicknesses (BMT)[4].

The metallic coated base steel (G450, G500 or G550 strength grades), conforms to AS 1397:2021: *Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium.*

Product	Metallic Coating	Base Metal Thickness (BMT)	Product mass (kg/m² flat product)
ZINC HI-TEN® steel	Z450	0.80mm	6.77

Manufacturing Process

In Australia, BlueScope manufactures steel from raw and recycled materials using an 'integrated steelmaking' method. This involves the use of iron ore, coal, steel scrap, fluxes (limestone and dolomite) and alloying materials to produce steel slab via the major processes of sintering, coke making, Blast Furnace/Basic Oxygen Furnace (BF-BOF) steelmaking and continuous slab casting, prior to hot rolling into hot rolled coil steel.

The hot rolled coil is then cold reduced. Cold reduction involves pickling (acid cleaning) the coil, followed by cold rolling, where the steel coil is compressed and elongated through rolls to reduce its thickness and increase the strength of the steel. Following cold reduction, the coil moves through a continuous hot-dipped metal coating line. At the metal coating line the steel is annealed to the required strength, metallic coated for corrosion resistance, and may be skin passed for improved surface finish. Finally, a chemical surface treatment is applied to provide protection from white rust and storage staining.

The coil is then packaged ready for shipment to customers for processing.

Downstream processing

ZINC HI-TEN® steel is supplied by BlueScope to downstream processors in coils. These coils are un-coiled and processed/formed into products for a wide variety of applications, such as purlins, scaffolding, fencing posts and railings.

3. Refer to the ZINC HI-TEN® steel datasheet at www.steel.com.au
4. ZINC HI-TEN® steel is offered in various coating classes, including Z100, Z200, Z275, Z450, and Z600. If you require a specific coating class and thickness (BMT) of ZINC HI-TEN® steel not currently covered in an EPD, please contact BlueScope Steel Direct on 1800 800 789 or email steeldirect@bluescopesteel.com.

Product Content

The average composition[5] of one flat square metre (1 m²) of ZINC HI-TEN® steel, with a substrate metal coating class of Z450 in 0.80mm base metal thickness (BMT) is:

Product Composition		Mass (kg)	Post-consumer recycled material, weight-% of product	Biogenic material, weight-% of product	Biogenic material, kg C/declared unit
Steel Substrate	Carbon Steel	6.28	0%[6]	0%	0
Metallic Coating (Z450)	Aluminium	<0.005	0%	0%	0
	Antimony	<0.001	0%	0%	0
	Zinc	0.473-0.488	0%	0%	0
Surface Treatment	Passivated	0.001	0%	0%	0
SUM		**6.77**	**0%[6]**	**0%**	**0**

Packaging Materials	Mass (kg)	Packaging (as % of product mass)	Biogenic material, kg C/declared unit
Steel	0.0057	<0.1%	0
Plastic	0.0039	<0.1%	0
Cardboard	0.0004	<0.1%	<0.0001
Timber	0.0083	<0.2%	0.0037
SUM	**0.0183**	**<0.3%**	**<0.0038**

ZINC HI-TEN® steel is compliant with the European REACH regulation[7]. 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". For safe use and maintenance, refer to the product Safety Data Sheet (SDS) at http://www.steel.com.au/library

What is an SDS?

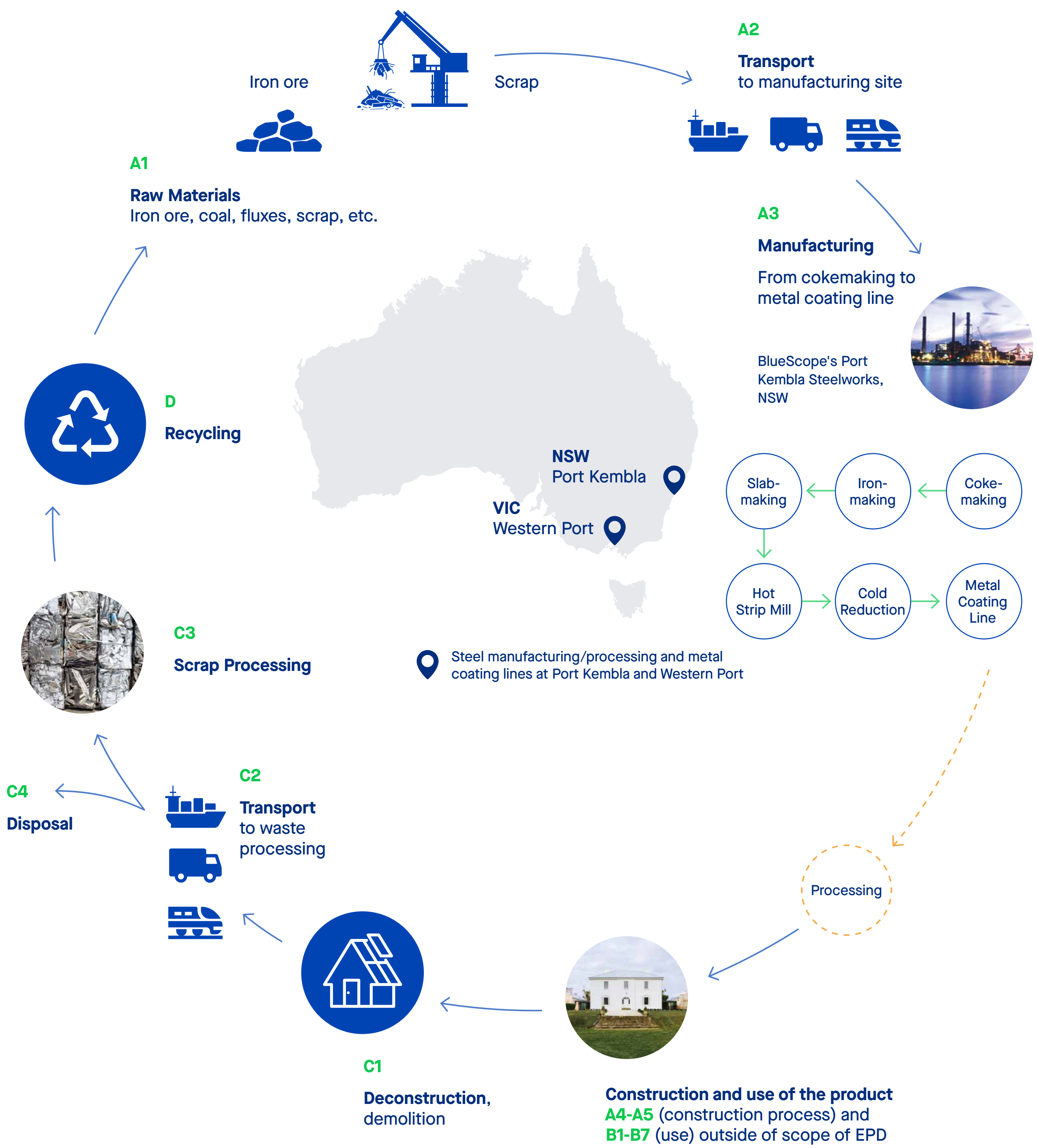
A Safety Data Sheet (SDS) is a document that describes the chemical and physical properties of a product or material and provides safe handling and use information.

Industry Classification

Product	Classification	Code	Category
ZINC HI-TEN® steel	UN CPC	41231	Flat-rolled products of non-alloy steel, clad, plated, coated or otherwise further worked
	ANZSIC	2110	Iron Smelting and Steel Manufacturing

5. The product composition provided is an average and variability among individual products is expected. Please note that we are constantly working to improve our products and changes to their composition may occur over time. If clarification on a particular product is needed please contact BlueScope Steel Direct on 1800 800 789.
6. As per EPD rules, only 'post-consumer' recycled content figures can be reported. Since BlueScope is only able to provide recycled content figures based on a combination of both pre- and post-consumer materials, this has to be reported as '0%' under EPD rules. For clarity, across the range of steel products manufactured by BlueScope in Australia, the average recycled content in the steel is 17.4%, which includes a combination of pre- and post-consumer recycled materials (according to recycled content categories defined in ISO 14021:2016). Scrap and iron-bearing materials generated and reclaimed from BlueScope's steelmaking, coating and painting operations represent an additional 6.8% recovered content, which is not reported as recycled content. Scrap from rollforming and fabrication processes are included as pre-consumer recycled content. The figures provided are based on FY20 data. For current recycled content figures please contact BlueScope Steel Direct on 1800 800 789.
7. Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

ZINC HI-TEN® steel (Z450) Manufacturing and Processing in Australia



Scope of Declaration

This declaration is for one flat square metre (1 m²) of ZINC HI-TEN® steel with a substrate metal coating class of Z450 in 0.80mm base metal thickness (BMT) manufactured by BlueScope in Australia[8]. The scope of this declaration is from cradle to gate (modules A1-A3), with modules C1-C4 and module D.

The use of the results of modules A1-A3 without considering the results of module C is discouraged.

Modules A4-A5 (construction process) and B1-B7 (use) have not been included due to the inability to predict how the material will be used following manufacture.

The system boundary applied in this study extends from mining of raw materials such as iron ore and coal; transport to and within the manufacturing site; coke, sinter, iron and steel manufacture; ancillary service operations; hot rolling of steel products, cold reduction, metallic coating and packaging for dispatch to direct customers at the exit gate of the manufacturing site.

The system boundary also includes manufacture of other required input materials, transport between processing operations, the production of external services such as electricity, natural gas and water, and the production of co-product materials within the steelmaking process, which have been removed by the use of allocation techniques. Wastes and emissions to air, land and water are also included, as are modules C1-C4 (end of life stage), and module D (reuse, recovery and/or recycling potential).

	Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundary
	Raw material supply	Transport	Manufacturing	Transport	Construction / installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction, demolition	Transport	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	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	AU	AU	AU	–	–	–	–	–	–	–	–	–	AU	AU	AU	AU	GLO
Specific data	>90%			–	–	–	–	–	–	–	–	–	–	–	–	–	–
Variation – products	<10%			–	–	–	–	–	–	–	–	–	–	–	–	–	–
Variation – sites	<10%			–	–	–	–	–	–	–	–	–	–	–	–	–	–

X = Module declared; ND = Not declared (such a declaration shall not be regarded as an indicator of a zero result).

8. As described in the Product Description on page 4.

Life Cycle Assessment (LCA) Methodology

This EPD has been produced in conformance with the requirements of PCR 2019:14 v1.3.4 Construction Products, the Instructions of the Australasian EPD Programme v4.1 and the International EPD® System General Programme Instructions (GPI) v4.0.

Primary data

This study focuses on the further processing of steel beyond hot rolling to produce ZINC HI-TEN® steel. Upstream hot rolled steel manufacturing data for Hot Rolled Coil - low carbon[9] steel used in this study was obtained from v2.0 of the EPD for Steel – Hot Rolled Coil (S-P-00557).

Primary data were collected for all relevant BlueScope manufacturing sites in Australia, for all inputs and outputs in the production stage (A1-A3). This study is based on an annual average for the time period July 2018 to June 2019. All direct emissions data were procured from the average results reported to the National Pollution Inventory over the 3-year period 2016 to 2019.

Secondary data

The secondary data used were procured from the Managed LCA Content (MLC) Database 2022, formerly known as GaBi Life Cycle Inventory Database[10]. Most datasets used have a reference year between 2018 and 2021 and all fall within the 10-year limit allowable for generic data under EN 15804. The residual electricity mix on the market is used for the A3 processes that BlueScope has control over. Since a residual grid mix has not been published for Australian states, the residual supply mix (RSM) is modelled using the specific electricity grid mix subtracting renewables from the consumption mix in the market (conservative estimation based on PCR v1.3.4 section 4.8.1). Generation from small solar in the market-based method's residual mix factor (RMF) is calculated as 53% of the small solar generation. This is the estimated share of rooftop small solar generation sent to the grid (self-consumed 'behind the meter' is calculated at the national level and is estimated to be 47%), following the DCCEEW approach (DCCEEW, 2023) based on the peer-reviewed source McKenna et al (2019).

Location-based grid mix EFs (using the published grid mix) is used for other electricity consumption including modules C and D.

Market-based results (using the RSM) are reported as the main results. For comparability with EPDs that were published with older PCRs (i.e. before PCR 1.3.2), which allowed the use of location-based grid mix when RSM wasn't available, the location-based results (using the published grid mix) are published under additional information for the GWP-GHG (IPCC AR5) indicator only. The original Sphera datasets are used to run the results for location-based grid mix before updating the electricity modelling based on RSM.

The composition of the residual electricity grid for New South Wales (NSW) and Victoria (VIC) are modelled in the Life Cycle for Experts (LCA FE) (formerly known as GaBi) Software for life cycle engineering, developed by Sphera Solutions, Inc. based on published data for the financial year 1st July 2021 – 30st June 2022 (Australian Government, 2023). Onsite consumption and grid transmission and distribution losses are calculated based on data from the Australian Government Department of Climate Change, Energy, the Environment and Water (Australian Government, 2023).

The NSW residual electricity mix is made up of coal (81.5%), photovoltaic (5.69%), natural gas (3.47%), heavy fuel oil (0.147%), and coal gases (0.000712%). Of the remaining electricity, 5.83% is imported from Victoria, and 3.32% is imported from Queensland. Onsite consumption (4.97%), and the medium voltage (1kV-60kV) grid's transmission and distribution losses (1.83%) are included. The emission factor for the NSW residual grid mix for the GWP-GHG indicator is 0.99 kg CO_2-eq./kWh based on EF3.0.

The VIC residual electricity mix is made up of lignite (85.1%), photovoltaic (5.41%), and natural gas (3.25%). Of the remaining electricity, 3.02% is imported from Tasmania, 2.22% is imported from Southern Australia, and 0.96% is imported from New South Wales. Onsite consumption (6.98%), and the medium voltage (1kV-60kV) grid's transmission and distribution losses (2.31%) are included. The emission factor for the Victoria residual grid mix for the GWP-GHG indicator is 1.13 CO_2-eq./kWh based on EF3.0.

Non-renewable primary energy as material utilisation (PENRM) based on PCRv1.3.4 (option C) is not calculated for packaging materials since energy input and output occur in the same module (A1-A3). Hence, the energy value for packaging will be balanced out in Module A1-A3. Additionally, the packaging energy is insignificant.

Water use in relation to BlueScope's manufacturing sites was modelled using the specific watershed scarcity data for each BlueScope manufacturing site.

Cut off criteria

All relevant and available data were collected. While cut-off criteria according to the Product Category Rules (PCR) section 4.4 were employed, much of the data which would have fallen within that scope were included where available, resulting in a data set which is robust and captures all significant contributors to the LCA results. Inputs knowingly excluded are the transport and packaging of minor inputs, such as lubricants and greases, which are used in very small quantities.

Personnel is excluded as per section 4.3.2 in the PCR (EPD International, 2024). thinkstep-anz consistently excludes environmental impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process ('capital goods'). This is because 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 may be applied to LCA studies inconsistently and could lead to reduced consistency and comparability of EPDs.

Allocation

For the modelling for BlueScope's manufacturing sites, where subdivision of processes was not possible, allocation was carried out using the most relevant physical quantity, predominantly the mass of throughput (e.g. steel coil) or surface area of the coil (e.g. surface coatings).

Economic allocation was not used in this study. In BlueScope's Hot Rolled Coil (HRC) EPD (used as an input for this study), any open scrap inputs into manufacturing have remained unconnected, and so have been treated as 'burden free' (BlueScope, 2020). This is not consistent with the PCR – however, adjusting BlueScope's Hot Rolled Coil EPD is not possible until such time as better data on the environmental burden of input scrap (i.e., economically allocated pre-consumer scrap) is available. It is planned to review this when the HRC EPD is updated in 2025. In the meantime, the HRC input is left unchanged to maintain consistency with the metallic coated and painted EPDs published in 2023. No use of system expansion was made (excepting Module D).

End of life

The modelling for Module C1 (deconstruction, demolition) was based on the use of a 100 kW construction excavator (fuel consumption of 0.172 kg diesel per tonne steel). The modelling for Module C2 (transport) assumed 50 km transport by truck to a waste processing facility or landfill.

The recycling scenario was based on the National Waste Report 2020[11], which indicates that the average metals recycling rate in Australia is 90%. This is considered to be a conservative estimate for flat steel construction products but was used in the absence of verified higher recycling rates.

End of life allocation follows the requirements of EN 15804:2012+A2:2019 section 6.4.3.3 and generally follows the polluter pays principle. Any open scrap inputs into manufacturing remain unconnected, and so are treated as 'burden free'. At the end of life of a product, scrap is collected for recycling and is thus available to produce a recycling credit within Module D. A credit for net scrap is given in Module D based on the base metal used in the product.

Key assumptions and qualifications:

- Accuracy of data measurement falls within normal industrial weighing systems accuracy limits of +/-5%.
- Transport and packaging of minor materials is insignificant to the overall impacts.
- Nominally identical products are produced on a combination of production lines in parallel, and therefore the impacts of each product are a weighted average of the various production lines. The impact of any differences in the composition of the products, with the exception of any change in base metal thickness (BMT), is insignificant on the outcomes of the LCA.
- Proprietary chemicals can be sufficiently modelled using guidance from Safety Data Sheets and conservative assumptions on that basis.
- Upstream data taken from the Sphera LCA FE database reflects average or generic production and therefore does not correspond to BlueScope's actual suppliers.
- The Module D recovery stage assumes that coatings are incinerated and metal coatings are lost as slag during the steel recycling process. This is a conservative assumption for metal coatings as they are likely to make up part of future steel alloys.

9. The term 'low carbon' steel refers to the carbon content in the metal alloy (which is typically less than 0.3% carbon content), and not to the carbon dioxide (CO_2) emissions associated with the product.
10. Sphera, Dataset Documentation, 2022, https://sphera.com/product-sustainability-gabi-data-search/
11. Pickin J et al., National Waste Report 2020, Prepared for the Department of Agriculture, Water and the Environment; 2020, p. 39.

Environmental Performance

The environmental impact indicators included in this EPD are described in the table below. All the result tables from this point will contain the abbreviations only. All results reported in MJ are in net calorific value.

Indicator	Abbreviation	Units	Characterisation Method
Core Environmental Impact indicators, in accordance to EN 15804:2012+A2:2019			
Climate change – total	GWP-total	kg CO_2-eq.	EF3.0 (PEF)
Climate change – fossil	GWP-fossil	kg CO_2-eq.	EF3.0 (PEF)
Climate change – biogenic	GWP-biogenic	kg CO_2-eq.	EF3.0 (PEF)
Climate change – land use and land use change	GWP-luluc	kg CO_2-eq.	EF3.0 (PEF)
Ozone depletion	ODP	kg CFC-11-eq.	WMO 2014
Acidification	AP	mol H^+-eq.	Accumulated Exceedance
Eutrophication aquatic freshwater	EP-freshwater	kg P-eq.	EUTREND model (ReCiPe)
Eutrophication aquatic marine	EP-marine	kg N-eq.	EUTREND model (ReCiPe)
Eutrophication terrestrial	EP-terrestrial	mol N-eq.	Accumulated Exceedance
Photochemical ozone formation	POCP	kg NMVOC-eq.	LOTOS-EUROS
Depletion of abiotic resources – minerals and metals[12]	ADP-minerals & metals	kg Sb-eq.	CML 2002a
Depletion of abiotic resources – fossil fuels[12]	ADP-fossil	MJ	CML 2002a
Water depletion potential[12]	WDP	m^3 world-eq. deprived	AWARE
Additional Environmental Impact indicators, in accordance to EN 15804:2012+A2:2019			
IPCC AR5 GWP-GHG[13]	GWP-GHG (IPCC AR5)	kg CO_2-eq.	IPCC 2013 (AR5)
IPCC AR5 GWP-GHG (location-based grid mix)[14]	GWP-GHG (IPCC AR5)	kg CO_2-eq.	IPCC 2013 (AR5)
EF 3.0 GWP-GHG[15]	GWP-GHG (EF 3.0)	kg CO_2-eq.	EF 3.0 (PEF)
Particulate Matter emissions	PM	Disease incidence	SETAC-UNEP, Fantke et al. 2016
Ionising radiation – human health[16]	IRP	kBq U-235-eq.	Human Health Effect model
Eco-toxicity – freshwater[12]	ETP-fw	CTUe	Modified USEtox model from EC-JRC
Human toxicity potential – cancer effects[12]	HTP-c	CTUh	Modified USEtox model from EC-JRC
Human toxicity potential – non-cancer effects[12]	HTP-nc	CTUh	Modified USEtox model from EC-JRC
Land use related impacts / soil quality[12]	SQP	dimensionless	Soil quality index (LANCA®)
Resource use parameters			
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ	n/a
Use of renewable primary energy resources used as raw materials	PERM	MJ	n/a
Total use of renewable primary energy resources	PERT	MJ	n/a
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ	n/a
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ	n/a
Total use of non-renewable primary energy resources	PENRT	MJ	n/a
Use of secondary material	SM	kg	n/a
Use of renewable secondary fuels	RSF	MJ	n/a
Use of non-renewable secondary fuels	NRSF	MJ	n/a
Net use of fresh water	FW	m^3	n/a
Waste Categories and Output Flows			
Hazardous waste disposed	HWD	kg	n/a
Non-hazardous waste disposed	NHWD	kg	n/a
Radioactive waste disposed	RWD	kg	n/a
Components for re-use	CRU	kg	n/a
Materials for recycling	MFR	kg	n/a
Materials for energy recovery	MER	kg	n/a
Exported energy – electrical	EEE	MJ	n/a
Exported energy – thermal	EET	MJ	n/a
Additional Environmental Impact indicators, in accordance to EN 15804:2012+A1:2013			
Global warming potential	GWP	kg CO_2-eq.	IPCC 2007 (AR4)
Ozone depletion potential	ODP	kg CFC-11-eq.	WMO 2003
Acidification potential	AP	kg SO_2-eq.	CML 2002b
Eutrophication potential	EP	kg PO_4^{3-}-eq.	CML 2002b
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.	CML 2002b
Abiotic depletion potential for non-fossil resources	ADPE	kg Sb-eq.	CML 2002b
Abiotic depletion potential for fossil resources	ADPF	MJ	CML 2002b
Additional Green Star v1.3 indicators			
Human Toxicity – cancer effects	HTc - GS	CTUh	USEtox
Human Toxicity - non-cancer effects	HTnc - GS	CTUh	USEtox
Land use	LU - GS	kg C deficit-eq.	Soil Organic Matter method
Resource depletion – water	RDW - GS	m^3-eq.	Water Stress Indicator
Ionising radiation	IR – GS	kBq U235-eq.	Human Health Effect model
Particulate matter	PM - GS	kg PM2.5-eq.	RiskPoll

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).

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.

12. 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.
13. 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. Market-based results (using the RSM) are reported as the main results.
14. Similar to the above indicator. For comparability with EPDs that were published with older PCRs (i.e. before PCR 1.3.2), which allowed the use of location-based grid mix when RSM wasn't available, the location-based results (using the published grid mix) are published under additional information for the GWP-GHG (IPCC AR5) indicator only. The original Sphera datasets are used to run the results for location-based grid mix.
15. This indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero. It has been included in the EPD following the PCR (EPD International, 2024).
16. 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 some construction materials, is also not measured by this indicator.

Results for 1 m² of ZINC HI-TEN® steel with Z450 metallic coating in 0.80mm base metal thickness (BMT)

In accordance to EN 15804:2012+A2:2019

Product mass: 6.77 kg/m² flat

Note: Results for 'A1-A3' are for one square metre (1 m²) of flat product. The design and size of the final formed product will affect how many flat square metres are required to produce it.

Environmental Impacts

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-total	kg CO_2-eq.	20.5	0.00423	0.0321	0.298	0.0328	-7.89
GWP-fossil	kg CO_2-eq.	20.5	0.00423	0.0321	0.298	0.0327	-7.89
GWP-biogenic	kg CO_2-eq.	0.0158	4.18E-07	1.07E-05	3.33E-04	6.97E-05	0.00478
GWP-luluc	kg CO_2-eq.	0.00138	3.07E-08	3.45E-07	1.14E-05	1.97E-05	-1.55E-04
ODP	kg CFC-11-eq.	2.98E-11	3.36E-16	3.22E-15	1.32E-12	4.30E-14	1.43E-13
AP	mol H^+-eq.	0.0754	2.01E-05	8.28E-05	0.00150	1.03E-04	-0.00739
EP-freshwater	kg P-eq.	1.20E-05	7.43E-10	5.28E-09	1.63E-07	2.51E-08	-1.40E-06
EP-marine	kg N-eq.	0.0155	9.70E-06	3.74E-05	3.21E-04	2.51E-05	-4.69E-04
EP-terrestrial	mol N-eq.	0.173	1.06E-04	4.11E-04	0.00350	2.76E-04	0.00162
POCP	kg NMVOC-eq.	0.0521	2.72E-05	7.99E-05	8.90E-04	7.95E-05	-0.00524
ADP-minerals & metals[17]	kg Sb-eq.	0.00224	5.16E-11	5.78E-10	2.50E-08	2.28E-09	-3.98E-07
ADP-fossil[17]	MJ	206	0.0561	0.425	3.22	0.464	-71.4
WDP[17]	m³ world-eq. deprived	1.35	3.14E-05	2.03E-04	0.116	0.00222	-1.52

Additional Environmental Impacts

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG (IPCC AR5)[18]	kg CO_2-eq.	20.0	0.00418	0.0318	0.295	0.0317	-7.59
GWP-GHG (IPCC AR5) - location-based grid mix[19]	kg CO_2-eq.	19.9	0.00418	0.0318	0.295	0.0317	-7.59
GWP-GHG (EF 3.0)[20]	kg CO_2-eq.	20.5	0.00423	0.0321	0.298	0.0328	-7.89
PM	Disease incidence	1.01E-06	2.27E-10	5.42E-10	1.46E-08	1.10E-09	-8.04E-08
IRP[21]	kBq U-235-eq.	0.267	1.06E-07	1.08E-05	5.63E-05	8.25E-04	0.186
ETP-fw[17]	CTUe	43.6	0.0141	0.171	0.615	0.138	-2.17
HTP-c[17]	CTUh	2.01E-09	2.37E-13	2.88E-12	2.75E-11	1.63E-11	-3.31E-09
HTP-nc[17]	CTUh	4.42E-07	1.48E-11	1.14E-10	9.17E-10	1.64E-09	-1.08E-07
SQP[17]	dimensionless	6.04	1.29E-04	0.00120	0.412	0.0360	0.980

Resource use

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	16.1	1.83E-04	0.00208	0.693	0.0379	4.87
PERM	MJ	0	0	0	0	0	0
PERT	MJ	16.1	1.83E-04	0.00208	0.693	0.0379	4.87
PENRE	MJ	206	0.0561	0.425	3.22	0.464	-71.4
PENRM	MJ	0	0	0	0	0	0
PENRT	MJ	206	0.0561	0.425	3.22	0.464	-71.4
SM	kg	0.979	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0
FW	m³	0.0320	4.72E-07	4.05E-06	0.00164	6.53E-05	-0.0344

Waste Categories and Output Flows

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
HWD	kg	5.91E-09	6.09E-14	6.90E-13	1.08E-10	7.00E-11	-5.24E-10
NHWD	kg	0.189	8.01E-07	1.03E-05	0.00100	0.678	1.51
RWD	kg	0.00231	8.22E-10	8.31E-08	4.39E-07	5.59E-06	1.61E-05
CRU	kg	0	0	0	0	0	0
MFR	kg	2.46	0	0	6.09	0	0
MER	kg	0	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0

End of Life

Parameter	Unit	Total
Steel collected separately	kg	6.09
Steel collected with mixed construction waste	kg	0.677
Recovery for re-use	kg	0
Recovery for recycling	kg	6.09
Recovery for energy recovery	kg	0
Disposal to landfill	kg	0.677
Assumptions for scenario	–	n/a

Biogenic Carbon Content

	Unit	A1-A3
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0.00227

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2

Additional results for 1 m² of ZINC HI-TEN® steel with Z450 metallic coating in 0.80mm base metal thickness (BMT)

In accordance to EN 15804:2012+A1:2013

Environmental Impacts

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP	kg CO_2-eq.	19.9	0.00416	0.0316	0.294	0.0310	-7.50
ODP	kg CFC11-eq.	3.51E-11	3.95E-16	3.79E-15	1.56E-12	5.06E-14	1.66E-13
AP	kg SO_2-eq.	0.0614	1.40E-05	5.82E-05	0.00122	8.28E-05	-0.00682
EP	kg PO_4^{3-}-eq.	0.00563	3.25E-06	1.27E-05	1.10E-04	8.83E-06	-1.58E-04
POCP	kg ethene-eq.	0.00918	1.38E-06	-1.55E-05	6.56E-05	7.73E-06	-0.00338
ADPE	kg Sb-eq.	0.00224	5.16E-11	5.78E-10	2.50E-08	2.31E-09	-3.85E-07
ADPF	MJ	197	0.0561	0.424	3.20	0.448	-73.3

Additional Green Star v1.3 Indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
HTc - GS	CTUh	5.15E-10	6.41E-15	8.83E-14	1.07E-11	1.43E-12	1.40E-10
HTnc - GS	CTUh	1.27E-10	3.06E-15	1.99E-14	3.40E-13	3.32E-14	3.90E-12
LU - GS	kg C deficit-eq.	2.67	1.06E-05	8.23E-05	0.0335	0.00314	0.406
RDW - GS	m³-eq.	0.0198	3.04E-07	2.58E-06	0.00109	3.28E-05	-0.0188
IR - GS	kBq U235-eq.	0.267	1.06E-07	1.08E-05	5.63E-05	8.25E-04	0.186
PM - GS	kg PM2.5-eq.	0.00527	1.00E-06	2.73E-06	8.03E-05	5.83E-06	-5.30E-04

17. 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.
18. 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. Market-based results (using the RSM) are reported as the main results.
19. Similar to the above indicator. For comparability with EPDs that were published with older PCRs (i.e. before PCR 1.3.2), which allowed the use of location-based grid mix when RSM wasn't available, the location-based results (using the published grid mix) are published under additional information for the GWP-GHG (IPCC AR5) indicator only. The original Sphera datasets are used to run the results for location-based grid mix.
20. This indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero. It has been included in the EPD following the PCR (EPD International, 2024).
21. 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 some construction materials, is also not measured by this indicator.

Interpretation of Results

Impact Category Results

The majority of production (A1-A3) impacts arise from the combustion of fossil fuels, either directly or in the upstream production of electricity and materials. The upstream production of Hot Rolled Coil steel substrate was the most significant contributor to most environmental impact indicators, and the base metal thickness (BMT) has significant influence on the results due to the dominance of the manufacturing of the steel substrate. This emphasises the importance of selecting the appropriate BMT for the intended application; where a thicker steel sheet does not contribute to structural integrity, a lighter-weight version of ZINC HI-TEN® steel with a lower BMT should be considered.

The upstream production of metal coating alloys – a combination of aluminium, zinc and magnesium applied to the steel substrate for corrosion protection – was the most significant contributor to ADP-minerals & metals, IRP, and SQP, and also contributed significantly to most indicators.

Assumption of average product – Sensitivity of results

When similar products are manufactured on different production lines, there is sometimes variation in results. Should production scheduling change significantly, this may be reflected in changes in the calculated impacts. The reason for these differences is the different mix of production routes that contribute to each product. Where products are preferentially made at different locations, the differences are most evident. While unlikely, should production scheduling change significantly, this may be reflected in changes in the calculated impacts. The variation in impact across production lines for ZINC HI-TEN® steel with a zinc coating class of Z450 is well under 10%.

References

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For further reference

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Product Website	steel.com.au
BlueScope Certificates and Credentials	steel.com.au/resources/articles/sustainability-certifications-and-credentials
ResponsibleSteel™ site certification	bluescope.com/sustainability/certification
BlueScope Sustainability Reporting	bluescope.com/sustainability/reports

Cover image: Symmons Plains Homestead, Perth TAS, which uses ZINC HI-TEN® steel roofing.
Architect: Cumulus Studio. Photography: Anjie Blair.

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