hazellbros

Environmental Product Declaration (EPD)

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

N40/20N/SCM concrete

manufactured in our Northern Region

Programme: The International EPD® System www.environdec.com
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EPD Registration no. EPD-IES-0014049:001
Date of issue 2024-09-20 | Valid until 2029-09-20
Geographical scope: Australia
EPD of a single concrete product from multiple locations, based on a representative site
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.epd-australasia.com

EPD® THE INTERNATIONAL EPD® SYSTEM

AUSTRALASIA EPD® ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

Contents

Disclaimer

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.

Programme information and verification

An Environmental Product Declaration (EPD) is a standardised way of quantifying the potential environmental impacts of a product or system. EPDs are produced according to a consistent set of rules – Product Category Rules (PCR) – that define the requirements within a given product category. These rules are a key part of ISO 14025 as they enable transparency and comparability between EPDs. This EPD provides environmental indicators for a single product, manufactured at Hazell Bros Group (HBG) facilities in Tasmania, Australia.
This EPD is a "cradle-to-gate plus modules C1-C4, D" declaration covering production and end-of-life life cycle stages.
This EPD is verified to be compliant with EN 15804. EPDs of construction products may not be comparable if they do not comply with EN15804. EPDs within the same product category but from different programs, or utilising different PCR documents, may not be comparable. See the disclaimer on the previous page.
Hazell Bros Group (HBG) Pty Ltd, as the EPD owner, has the sole ownership, liability, and responsibility for the EPD.

Declaration Owner:	**Hazell Bros Group (HBG) Pty Ltd** 14 Farley Street, TAS 7009, Australia www.hazellbros.com.au +61 03 6277 7888 head.office@hazellbros.com.au		
EPD Program Operator:	**EPD International AB,** Box 210 60, SE-100 31 Stockholm, Sweden, Email: 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 Produced by:	**start2see Pty Ltd** 36 Renaissance Bvd, Mernda, VIC 3754, Australia Web: www.start2see.com.au Email: Rob.Rouwette@start2see.com.au Phone: +61 403 834 470		
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CEN standard EN 15804 served as the core PCR

PCR:	PCR 2019:14 Construction Products, Version 1.3.4, 2024-04-30 (valid until 2025-06-20) C-PCR-003 (to 2019:14) Concrete and concrete elements, version 2023-01-02
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Independent verification of the declaration and data, according to ISO 14025:	☐ EPD process certification ☒ EPD verification (External)
Third party verifier: Approved by EPD Australasia Ltd	Claudia A. Peña PINDA LCT SpA Email: pinda.lct@gmail.com
Procedure for follow-up of data during EPD validity involves third-party verifier:	☐ Yes ☒ No

About Hazell Bros Group (HBG)

Hazell Bros was founded in 1944 by brothers Donald and Rowley Hazell as a transport business operating in Southern Tasmania. In the 1950s, Hazell Bros became involved in earthmoving projects and by the 1970s a civil construction arm began.

Over the next 30 years, the business continued to expand throughout Tasmania adding quarries, concrete batch plants, a commercial building business and a crane company to the portfolio. In 2010, Hazell Bros expanded into Victoria and Queensland acquiring civil construction and plant hire operations and in 2013, was awarded a long-term contract with Nyrstar Port Pirie (SA) for materials handling and dust suppression activities.

Hazell Bros remains a family-owned and operated business with second-generation brothers Geoffrey, Managing Director, and Robert Hazell, owning and heading up operations.

Throughout its 80-year history Hazell Bros has diversified its operations and business offerings to meet the prevailing economic conditions. The core business functions today are Civil Construction, Quarries, Concrete, Construction Material Testing, Plant Hire, Transport, Asset Servicing and Industrial Services.

Hazell Bros operates fixed batching plants throughout Tasmania. There are four plants located in the south at Derwent Park, Leslie Vale, Brighton and Cambridge; two plants operating from Rocherlea and Breadalbane (Raeburn) in Launceston; and three plants servicing the northwest from Burnie, Devonport and Shearwater.

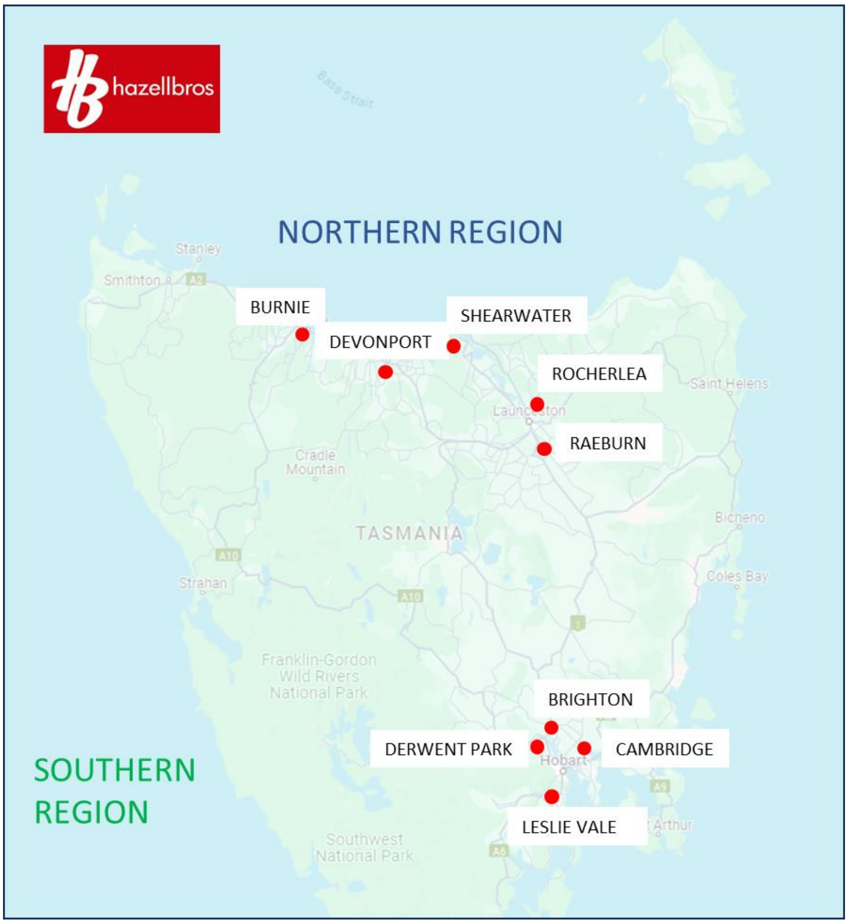
Hazell Bros supplies concrete for commercial, industrial and residential use.

This EPD covers N40/20N/SCM concrete.

Product description

Hazell Bros manufactures ready mixed concrete at nine different sites throughout Tasmania. For the purpose of our EPDs, the sites have been grouped into a Northern Region (five sites: Rocherlea, Breadalbane (Raeburn), Burnie, Devonport and Shearwater) and Southern region (four sites: Derwent Park, Leslie Vale, Brighton and Cambridge).

This EPD covers a mix manufactured in the Northern Region (map below).



The concrete is batched in line with Australian Standards, AS1379 Specification and Supply of Concrete.

Hazell Bros is able to design concrete mixes tailored to specific needs, supported by a NATA-accredited QualTech (TAS) laboratory.

The product included in this EPD, its 28-day strength grade and density are shown below. The product composition (presented per declared unit of 1 m^3) is presented in Table 1. For reasons of confidentiality, a range is provided.

Product	Strength grade	Density
N40/20N/SCM	40 MPa	2 477 kg/m^3

Table 1: Product content per declared unit

Ingredient	Proportion (% m/m)	Post-consumer material, weight (%)	Renewable material, weight (%)
Cement ¤	3-19%	0%	0%
Slag (GGBFS) † ‡	0-6%	0%	0%
Fly Ash † ‡	0-4%	0%	0%
Silica Fume † ‡	0-2%	0%	0%
Coarse aggregates †	0-91%	0%	0%
Manufactured sand †	0-95%	0%	0%
Natural sand †	0-95%	0%	0%
Water	1-11%	0%	0%
Admixtures	<0.3%	0%	0%
Total	**2 477 kg/m^3**	**0%**	**0%**

¤ Cement in concrete contains traces of Chromium VI (hexavalent).
† Crystalline-silica (quartz) may be a constituent of sand, crushed stone, gravel, blast furnace slag, fly ash and silica fume used in any particular concrete mix.
‡ Cementitious additives may contain traces of metals.

The product, as supplied, is non-hazardous. The products included in this EPD do not contain any substances of very high concern as defined by European REACH regulation* in concentrations >0.1% (m/m). Dust from this product is classified as Hazardous according to the Approved Criteria for Classifying Hazardous Substances 3rd Edition (NOHSC 2004). Concrete products are classified as non-dangerous goods according to the Australian Code for the Transport of Dangerous Goods by Road and Rail. When concrete products are cut, sawn, abraded or crushed, dust is created which contains crystalline silica, some of which may be respirable (particles small enough to go into the deep parts of the lung when breathed in), and which is hazardous. Exposure through inhalation should be avoided.

The product code for ready mixed concrete is UN CPC 375 (Articles of concrete, cement and plaster) and ANZSIC 20330 (Concrete – ready mixed – except dry mix).

* Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals.

Technical Compliance

Hazell Bros concrete products comply with relevant technical specifications as per AS 1379:2007 "Specification and supply of concrete", applicable legislation, regulations and industry standards plus project requirements.

Declared unit

"1 cubic metre (m^3) of ready-mixed concrete, as ordered by our clients"

The density of this product is 2 477 kg/m^3. Note that modules C and D are based on a typical product with a density of 2 400 kg/m^3.

Scope of the Environmental Product Declaration

This EPD covers life cycle stages A1-3, C1-4 and D. Stages A4, A5 and B1-7 have not been included as these are better defined at building or structure level.

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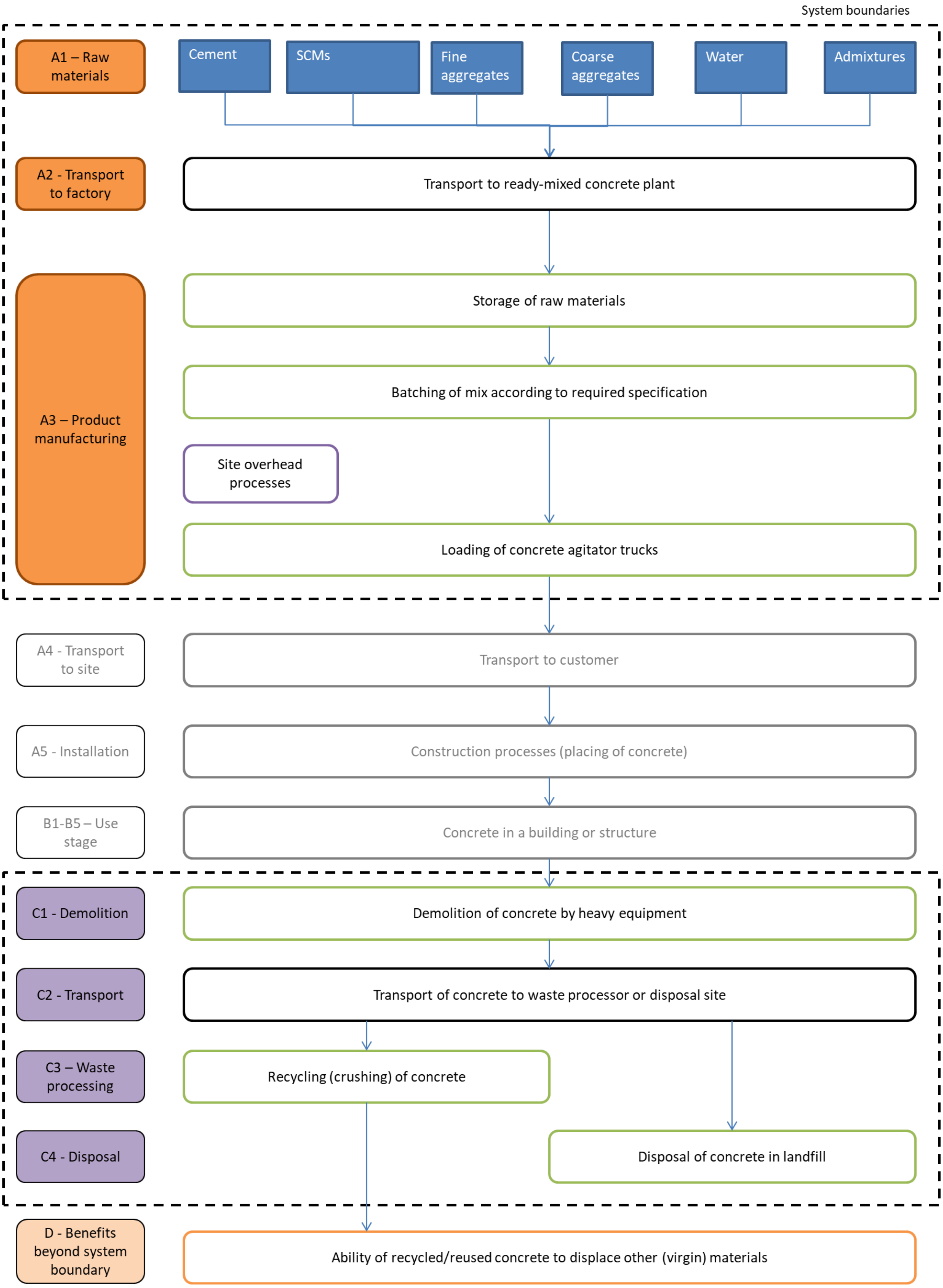
Table 2: Scope of the EPD

Stages	Product Stage			Construction Stage		Use Stage							End-of-life Stage				Benefits beyond system boundary
	Raw Materials	Transport	Production	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/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
				Scenario		Scenario							Scenario				Scenario
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	AU
Share of specific data	90%																
Variation products	Not relevant																
Variation sites	<10%																

X = module is included in this study
ND = module is not declared. When a module is not accounted for, the stage is marked with “ND” (Not Declared).
ND is used when we cannot define a typical scenario.

Note: Where cement data are taken from our supplier-specific EPD, and because the supplier operates an integrated clinker-cement manufacturing facility, we have treated this cement input as 100% specific data.

Figure 1 – Flow diagram of main ready-mixed concrete production processes, life cycle stages and visualisation of system boundaries



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Product Stage (A1-A3)

Raw Materials – Module A1

Extraction and processing of raw materials results in environmental impacts from the use of energy and resources, as well as from process emissions and waste. Cement is produced from limestone and gypsum, aggregates and natural sand are extracted from quarries. Fly ash, silica fume and ground granulated blast furnace slag (GGBFS) are rest products from electricity generation, silicon and alloys manufacturing in furnaces and steel production respectively.

Admixtures are specialised chemical formulations that are typically produced by blending selected ingredients.

Coarse aggregates and manufactured sand are sourced from Hazell Brothers quarries in Long Hill and Raeburn in the Northern region and Leslie Vale in the Southern region. Natural sand is sourced from Hazell Brothers' Beauty Point Sand quarry or a third-party supplier.

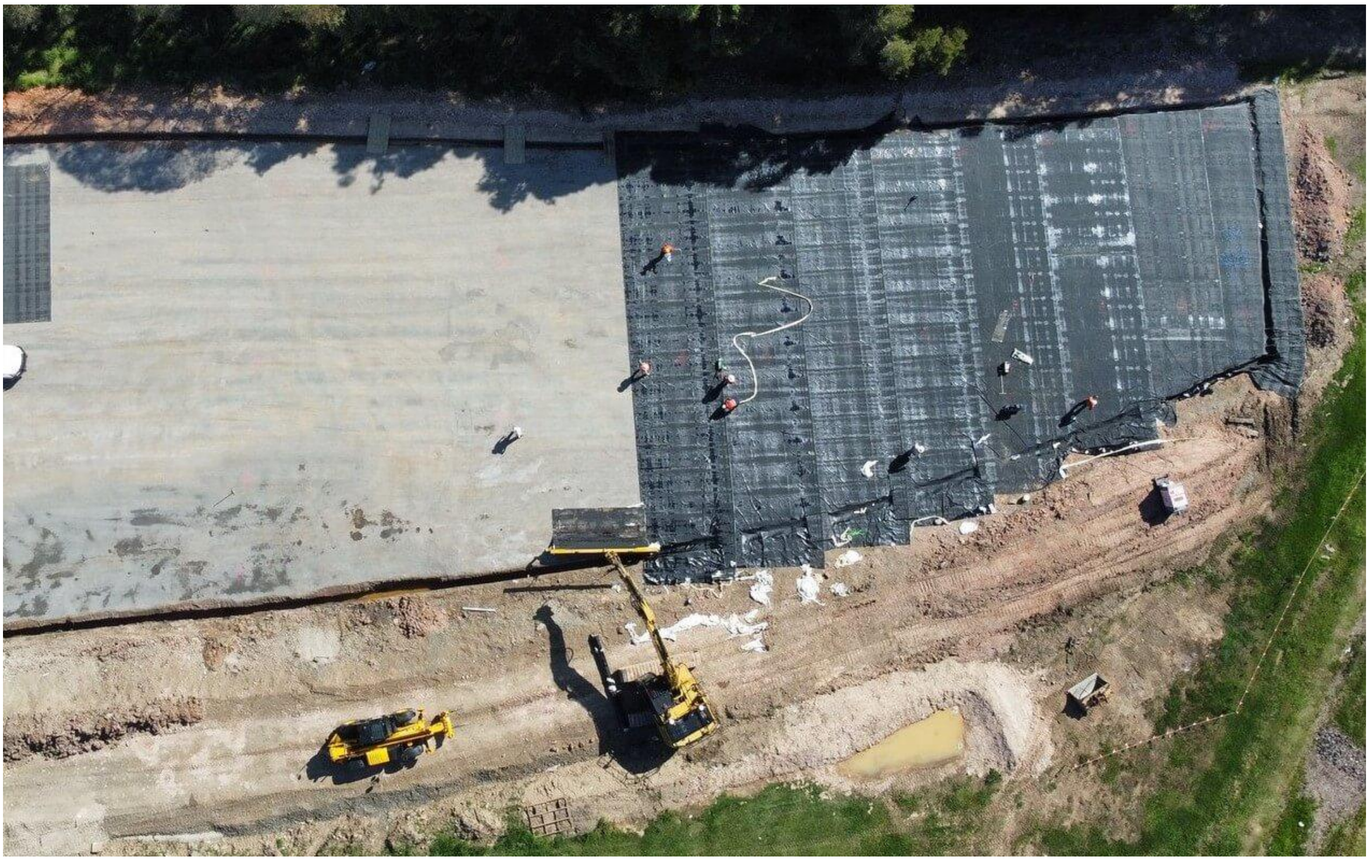
Transportation – Module A2

Raw materials are typically transported from suppliers to our site via (articulated) trucks. Materials that come from the mainland or overseas, are shipped to Devonport before they are sent to the sites. Transport of raw materials have been included in the LCA based upon actual transport modes and distances relevant to the sites.

Manufacturing – Module A3

Ready mixed concrete products are manufactured by mixing the concrete constituents in dosed quantities to achieve desired engineering properties.

The "**Construction process stage**" and "**Use stage**" have been excluded from the life cycle assessment, as the ready mixed concrete can be used for a range of different applications for which the use scenarios are unknown. The impacts of these stages are best determined at project level.



End of life stage (C1-C4)

The end-of-life modules for ready-mixed concrete are based on generic scenarios. The scenarios included are currently in use and are representative for one of the most probable alternatives.

Module C1 covers demolition of the concrete at the end of its service life. For concrete produced in Tasmania, we have used the end-of-life scenario representative for Tasmanian building & demolition materials products based on the National Waste Report 2022 (NWR 2022). This scenario implies that 2.4% of the concrete is recycled and the remaining 97.6% of the concrete is sent to landfill.

Module C2 comprises the transport from the demolition site to a recycling centre or landfill site (50km). Module C3 encompasses the recycling process (i.e. crushing of concrete), while Module C4 represents disposal of concrete in a landfill site.

The concrete collected for recycling reaches end-of-waste status when it is crushed and stockpiled as "recycled crushed concrete" (RCC) aggregates. Crushed concrete is assumed to substitute primary (quarried) material without needing further processing.

We have modelled a single scenario for concrete with a density of 2 400 kg/m^3. This is a conservative value for the concrete mixes covered by our EPDs. The impact of this simplification is much smaller than the impact of the scenario and data assumptions applied to the end-of-life modules.

Due to high uncertainty in the parameters and lack of data, CO_2-uptake (carbonation) has not been included at end-of-life.

Resource recovery stage (D)

Module D includes any benefits and loads from net flows leaving the product system (that have passed the end-of-waste state). For this EPD, any material collected for recycling and processed in Module C3, is considered to go through to Module D. We have assumed that Recycled Crushed Concrete aggregates (the output of module C3) replace virgin aggregates (crushed rocks) in module D.

Per cubic metre of concrete, module D credits the avoided impacts for 60 kg of crushed aggregates.

Table 3: End-of-life scenario parameters

Processes	Quantity per m^3 of concrete	Unit
Collection process specified by type	2 400 0	kg collected separately kg collected with mixed construction waste
Transport from demolition site to recovery / disposal sites	50	km transport
Recovery system specified by type	0 58 0	kg for re-use kg for recycling kg for energy recovery
Disposal to landfill	2 342	kg product or material for final deposition
Assumptions for scenario development	148	Assuming 61.7 MJ of diesel per tonne for the demolition process (C1), based on dataset "*Disposal, building, reinforced concrete, to final disposal/CH U/AusSD U*"

Life Cycle Assessment (LCA) Methodology

Background Data

Hazell Bros has collected and supplied the primary data for the ready-mixed concrete LCA based on the reporting period 1 June 2022 – 31 May 2023. Hazell Bros Quarries provided data for the coarse aggregates and manufactured sand that they supply to the concrete business. Cement Australia's EPD of Goliath General Purpose cement provided the data for cement (Cement Australia 2023). Data for admixtures has been sourced from EPDs published by EFCA (EFCA 2021, 2023). Other background data are sourced from AusLCI and the AusLCI shadow database v1.42 (AusLCI 2023). As a result, the vast majority of the environmental profile of our products is based on life cycle data less than three years old.

Background data used is less than 10 years old. Methodological choices have been applied in line with EN 15804:2012+A2:2019; deviations have been recorded.

Key assumptions

- The concrete composition is provided by Hazell Bros and has been accepted as is.
- There is a possible misalignment between the cement EPD used as an input into the model, which is likely based on EF 3.0, and the EF 3.1 characterisation factors used for this EPD.
- Additional environmental impact indicators are not declared in the admixture EPDs, which results in underreporting of these indicators.
- Allocation approaches may have a material effect on concrete products containing fly ash, ground granulated blast furnace slag, and/or silica fume.
- The end-of-life scenario (2.4% recycling; 97.6% landfill) is based on landfill and recycling rates for masonry products in Tasmania, as per the National Waste Report 2022 (NWR 2022).

Cut-off criteria

- The cut-off criteria applied are 1% of renewable and non-renewable primary energy usage, 1% of the total mass input of a process and 1% of environmental impacts.
- The contribution of capital goods (production equipment and infrastructure) and personnel is excluded, as these processes are non-attributable and they contribute less than 10% to GWP-GHG.

Allocation

The key processes that require allocation are:

- Production of concrete mixes: All shared processes are attributed to concrete products based on their volume.
- Fly ash: all environmental impacts of the power plant have been allocated to the main product: electricity, fly ash has only received the burdens of the transport to our site.
- Blast Furnace Slag (BFS): BFS is a by-product from steelmaking. We have used the AusLCI data for BFS ('Blast Furnace Slag allocation, at steel plant / AU U'), which contain impacts from pig iron production allocated to blast furnace slag using economic allocation. One tonne of slag equals the environmental impact of 0.0127 tonnes of pig iron. Drying of slag (using 769 MJ of natural gas per tonne) and milling of slag (using 50 kWh/t electricity) is included.
- Silica fume: Silica fume is a by-product of silicon metal or ferrosilicon alloys production. Economic allocation is used to attribute impacts between silica fume and ferrosilicon production.
- Aggregates: Coarse aggregates and manufactured sand are produced through crushing of rock, which is graded in different sizes. The energy required for the crushing and screening does not differentiate from products. Therefore, impacts are allocated to products, based on the mass. In effect, all aggregates have the same environmental profile.

Electricity

- Electricity has been modelled for processes that Hazell Bros controls (quarries and concrete plants) using adjusted AusLCI data to represent the estimated residual electricity grid mix in Tasmania. This is done by removing renewables from the Australian Energy Statistics 2023 data (Table O7.1). The GWP-GHG of the electricity is 0.77 kg CO_2e / kWh. The proxy residual grid mix is made up of natural gas (94.2%) and oil products (5.8%). The selection of the electricity grid mix has an impact on the results. If a location-based approach was taken, the carbon footprint would be 1-6% lower. This should be considered when comparing this EPD against other concrete EPDs.
- Electricity used in other processes is typically modelled following a location-based approach.

Life Cycle Assessment (LCA) indicators

An LCA serves as the foundation for this EPD. An LCA analyses the production systems of a product. It provides comprehensive evaluations of all upstream and downstream energy inputs and outputs. The results are provided in a form which covers a range of environmental impact categories.

Table 4: Environmental indicators legend (EN 15804+A2)

Core indicators	Acronym	Unit
Climate change – total	GWP-total	kg CO_2 equivalent
Climate change – fossil	GWP-fossil	kg CO_2 equivalent
Climate change – biogenic	GWP-biogenic	kg CO_2 equivalent
Climate change – land use and land use change	GWP-luluc	kg CO_2 equivalent
Ozone layer depletion	ODP	kg CFC-11 equivalent
Acidification	AP	mol H^+ equivalent
Eutrophication aquatic freshwater	EP-freshwater	kg P equivalent
Eutrophication aquatic marine	EP-marine	kg N equivalent
Eutrophication terrestrial	EP-terrestrial	mol N equivalent
Photochemical ozone formation	POCP	kg NMVOC equivalent
Abiotic depletion potential – elements[2]	ADP minerals & metals	kg Sb equivalent
Abiotic depletion potential – fossil fuels[2]	ADP fossil	MJ, net calorific value
Water use[2]	WDP	m^3 world equivalent deprived
Additional indicators	**Acronym**	**Unit**
Global Warming Potential – Greenhouse gases	GWP-GHG	kg CO_2 equivalent
Particulate matter emissions	PM	disease incidence
Ionising radiation, human health[1]	IRP	kBq U235 equivalent
Ecotoxicity (freshwater)[2]	ETP-fw	CTUe
Human toxicity, cancer effects[2]	HTP-c	CTUh
Human toxicity, non-cancer effects[2]	HTP-nc	CTUh
Land use related impacts / soil quality[2]	SQP	- (dimensionless)
Additional GHG indicator	**Acronym**	**Unit**
Carbon footprint in line with IPCC AR5[3]	**GWP-GHG (IPCC AR5)**	**kg CO_2 eq**

[1] 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.

[2] 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.

[3] **Note regarding various GWP indicators:** GWP-total is calculated using the European Union's Joint Research Centre's characterisation factors (CFs) based on the "EF 3.1 package" for CFs to be used in the EU's Product Environmental Footprint (PEF) framework. CFs listed by JRC are based on the IPCC AR6 method (IPCC 2021) and include indirect radiative forcing, which results in higher numerical Global Warming Potential (GWP) values than the CFs in the internationally accepted (IPCC 2013). The GWP-GHG indicator is identical to GWP-total except that the CFs for biogenic CO_2 are set to zero. The GWP-GHG indicator in PCR 2019:14 v1.3.4 differs from the GWP-GHG in earlier (pre v1.3) PCR 2019:14 versions. The "*GWP-GHG (IPCC AR5)*" indicator is determined using the IPCC AR5 GWPs with a 100-year time horizon (IPCC 2013). This indicator is aligned with Australia's greenhouse gas reporting frameworks.

Table 5: Legend for parameters describing resource use, waste and output flows

Parameter	Acronym	Unit
Parameters describing resource use		
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ_{NCV}
Use of renewable primary energy resources used as raw materials	PERM	MJ_{NCV}
Total use of renewable primary energy resources	PERT	MJ_{NCV}
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ_{NCV}
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ_{NCV}
Total use of non-renewable primary energy resources	PENRT	MJ_{NCV}
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ_{NCV}
Use of non-renewable secondary fuels	NRSF	MJ_{NCV}
Use of net fresh water	FW	m^3
Waste categories		
Hazardous waste disposed	HWD	kg
Non-Hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg
Output flows		
Components for re-use	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported energy	EE	MJ

Table 6: Legend for EN 15804+A1 indicators

Indicator	Acronym	Unit
Global warming potential	GWP	kg CO_2 equivalent
Ozone layer depletion potential	ODP	kg CFC-11 equivalent
Acidification potential	AP	kg SO_2 equivalent
Eutrophication potential	EP	kg PO_4^{3-} equivalent
Photochemical oxidation (Photochemical ozone creation) potential	POCP	kg ethylene equivalent
Abiotic depletion potential - elements	ADPE	kg Sb equivalent
Abiotic depletion potential – fossil fuels	ADPF	MJ_{NCV}

VARIATION (A1-A3) PER IMPACT CATEGORY

The results of the LCA are based on data from a representative plant for the region. The environmental profiles of concrete manufactured at other plants in the same region are largely similar, with variations mainly due to differences in transport distances for raw materials supplied to the concrete plant, plus differences in plant operations (including differences in waste volumes). Most mandatory indicators stay well within the ±10% range as required by the PCR. We have analysed the maximum variation for the Northern region: the variations for all concrete mixes and plants covered in the Northern region stay within ±10% of the reported values for Rocherlea, except for ozone layer depletion (-0% to +42%), Resource use, fossils (-0% to +12%) and water use (-0% to +53%) impacts.

Results: Environmental profiles

The following section presents the results for each Life Cycle Assessment module. The results have been calculated (based on the EFv3.1 set of characterisation factors) with SimaPro software v9.5.0.0. To separate the use of primary energy into energy used as raw material and energy used as energy carrier, Option B from Annex 3 of PCR 2019:14 has been applied.

Please consider the following mandatory statements when interpreting the results:

"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".

"The use of the results of modules A1-A3 (A1-A5 for services) without considering the results of module C is discouraged".

N40/20N/SCM concrete

The environmental indicators are expressed per m^3 of concrete.

Table 7: **Environmental indicators EN 15804+A2, N40/20N/SCM ready mixed concrete, Northern Region, per m^3**

Environmental Indicator	Unit	Module A1-A3	Module C1	Module C2	Module C3	Module C4	Module D
Core Indicators							
GWP-total	kg CO_2-eq.	2.35E+02	1.27E+01	1.54E+01	2.37E-01	5.55E+00	-3.14E-01
GWP-fossil	kg CO_2-eq.	2.35E+02	1.27E+01	1.54E+01	2.36E-01	5.55E+00	-3.15E-01
GWP-biogenic	kg CO_2-eq.	1.04E-01	8.43E-04	9.50E-04	2.25E-04	4.48E-04	1.03E-03
GWP-luluc	kg CO_2-eq.	1.94E-05	6.09E-06	7.26E-06	1.10E-07	2.69E-06	-2.07E-07
ODP	kg CFC11-eq.	5.12E-06	2.03E-06	2.42E-06	2.99E-08	9.08E-07	-2.71E-08
AP	mol H+ eq.	1.18E+00	1.40E-01	1.35E-01	6.50E-04	1.33E-02	-1.10E-02
EP-freshwater	kg P eq.	3.37E-05	1.69E-06	9.23E-07	1.75E-07	7.58E-07	-3.04E-07
EP-marine	kg N eq.	4.33E-01	6.08E-02	4.25E-02	1.16E-04	2.39E-03	-3.61E-03
EP-terrestrial	mol N eq.	5.20E+00	6.67E-01	4.66E-01	1.26E-03	2.61E-02	-5.54E-02
POCP	kg NMVOC eq.	1.15E+00	1.78E-01	1.13E-01	3.38E-04	7.02E-03	-9.30E-03
ADP minerals & metals[2]	kg Sb eq.	1.01E-06	1.50E-08	1.78E-08	5.87E-08	6.52E-09	-1.26E-08
ADP fossil[2]	MJ (NCV)	1.91E+03	1.77E+02	2.11E+02	3.37E+00	7.90E+01	-4.54E+00
WDP	m^3 world eq. deprived	5.24E+01	1.14E+00	1.35E+00	7.30E-02	5.08E-01	-6.96E-02
Additional indicators							
GWP-GHG	kg CO_2-eq.	2.35E+02	1.27E+01	1.54E+01	2.37E-01	5.55E+00	-3.15E-01
PM	Disease incidence	1.02E-05	3.70E-06	7.60E-07	4.33E-09	7.02E-08	-1.12E-07
IRP[1]	kBq U235 eq.	1.26E-03	2.59E-04	3.08E-04	4.77E-05	1.15E-04	-1.32E-05
ETP-fw[2]	CTUe	2.71E+02	3.93E+01	3.01E+01	3.74E-01	1.12E+01	-6.95E+00
HTP-c[2]	CTUh	1.08E-08	4.92E-10	6.59E-11	4.95E-12	4.39E-11	-2.25E-11
HTP-nc[2]	CTUh	1.87E-08	2.62E-09	1.26E-09	3.23E-11	5.31E-10	-1.33E-10
SQP[2]	-	1.02E+03	8.52E-01	9.47E-01	7.97E-01	1.31E+02	-8.10E+00
Carbon footprint							
GWP-GHG (IPCC AR5)	**kg CO_2 eq**	235	12.7	15.4	0.24	5.56	-0.3

Footnotes:

[1] 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.

[2] 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.

Table 8: EN 15804+A2 parameters, N40/20N/SCM ready mixed concrete, Northern Region, per m^3

Parameter	Unit	Module A1-A3	Module C1	Module C2	Module C3	Module C4	Module D
PERE	MJ_{NCV}	1.23E+02	2.75E-01	3.03E-01	5.83E-02	1.55E-01	-4.52E-02
PERM	MJ_{NCV}	2.64E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ_{NCV}	1.23E+02	2.75E-01	3.03E-01	5.83E-02	1.55E-01	-4.52E-02
PENRE	MJ_{NCV}	1.45E+03	1.77E+02	2.11E+02	3.37E+00	7.90E+01	-4.54E+00
PENRM	MJ_{NCV}	1.30E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ_{NCV}	1.47E+03	1.77E+02	2.11E+02	3.37E+00	7.90E+01	-4.54E+00
SM	kg	1.67E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ_{NCV}	9.57E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	8.49E-01	2.57E-02	3.06E-02	1.20E-03	1.15E-02	-1.49E-03
HWD	kg	3.04E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	2.25E-01	8.13E-04	8.96E-04	1.65E-04	2.34E+03	-1.03E-04
RWD	kg	1.57E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	8.14E+01	0.00E+00	0.00E+00	5.76E+01	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 9: **EN 15804+A1 indicators*, N40/20N/SCM ready mixed concrete, Northern Region, per m^3**

Environmental Indicator	Unit	Module A1-A3	Module C1	Module C2	Module C3	Module C4	Module D
GWP	kg CO_2 eq	2.40E+02	1.27E+01	1.53E+01	2.36E-01	5.54E+00	-3.15E-01
ODP	kg CFC11 eq	4.05E-06	1.60E-06	1.91E-06	2.36E-08	7.17E-07	-2.14E-08
AP	kg SO_2 eq	7.69E-01	9.93E-02	7.48E-02	4.11E-04	1.07E-02	-6.90E-03
EP	kg PO_4^{3-} eq	1.60E-01	2.04E-02	1.43E-02	4.03E-05	8.22E-04	-1.64E-03
POCP	kg C_2H_4 eq	2.62E-02	9.74E-03	4.83E-03	2.29E-05	5.31E-04	-1.71E-04
ADPE	kg Sb eq	4.01E-06	1.52E-08	1.80E-08	5.87E-08	6.64E-09	-1.30E-08
ADPF	MJ_{NCV}	1.52E+03	1.77E+02	2.11E+02	3.37E+00	7.90E+01	-4.54E+00

* Note: the indicators and characterisation methods are from EN 15804:2012+A1:2013, but other LCA rules (system boundaries, allocation, etc.) are according to EN 15804:2012+A2:2019; i.e., the results of the "A1 indicators" shall not be claimed to be compliant with EN 15804:2012+A1:2013

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Contact information

(03) 6277 7888
www.hazellbros.com.au
head.office@hazellbros.com.au
14 Farley Street
Derwent Park, Tasmania, 7009
Australia

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